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VIEWS, NEWS AND INTERVIEWS.

A recent daily paper stated that in his early days Mr. Edison was in the habit of rooming in a certain place in New York city and keeping the whole neighborhood awake at unseemly hours by playing on the fiddle. A friend showed the article to the distinguished inventor recently, and he promptly replied that with the exception that he had never lived at the place mentioned and never played on the fiddle, the article was correct. It would have been news to the electrical field generally to have learned that Edison was a violinist.

Two members of the technical staff of the Wireless Telegraph and Signal Company, Limited, of London, and possibly Signor Marconi himself, expect to visit the United States next October.

Lord Charles Beresford has appeared as a warm advocate of automobile cabs. He attributed the congestion of London streets to the use of horses, and said: "While I was in New York I was supplied with a motor cab which had the appearance of a cab and the manners of a kangaroo, but it always got me safely to my destination." His lordship also pointed out how much Great Britain is behind the times in the use of electricity. He was amazed, he said, to see how much work was done by electricity on board American warships where the English used steam.

The stock of the new Amalgamated Copper Company, capital $75,000,000, was oversubscribed six times.

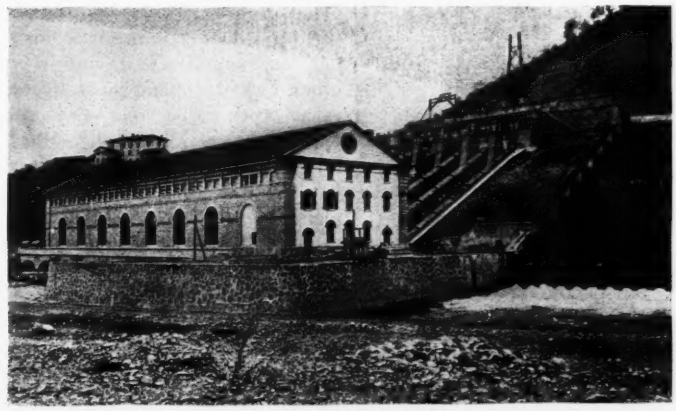
A signal evidence of the purpose of the United States to maintain friendly relations with Germany has been given in the action of the President, at the instance of Secretary Hay, in approving the project for a new transatlantic cable running between Germany and the United States. The project was brought forward by prominent German-American interests, and has had the active support of Dr. Von Holleben, the German Ambassador. The new company is to be known as the German-American Telegraph Company.

It was announced last week that Andrew Carnegie, the great iron master and former telegraph operator, would retire from business and that he had sold his iron and steel properties to a new trust for $150,000,000 cash.

Workmen of the Metropolitan Street Railway Company unearthed in Fulton street, New York, the other day the remains of an old trolley slot, recalling the fact that on that street the underground trolley system had its first trial more than 15 years ago. The Bentley-Knight system was used on Fulton street for several months.

Two cars to carry local freight have been placed in operation on the Consolidated Traction lines in Pittsburgh, and more will be placed as required. The plan is eventually to make house-to-house deliveries along the routes, but for the present freight stations have been established. A city freight service is also to be instituted on the United Traction lines soon.

The Kansas City Suburban Belt Railroad has made an order that any employé entering a saloon or drinking while on duty shall be summarily discharged.



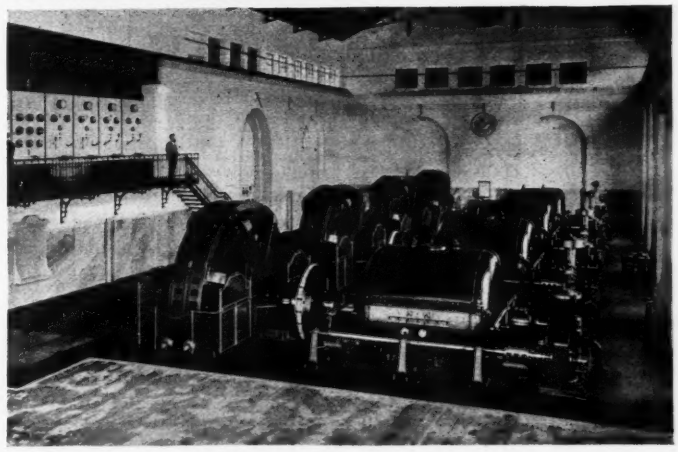


FIG. 1.—THE MILAN-PADERNO TRANSMISSION—EXTERIOR VIEW OF POWER HOUSE, PENSTOCKS AND WASTE-WEIR.

FIG. 2.—INTERIOR OF POWER HOUSE, SHOWING TURBINES, DYNAMOS AND SWITCHBOARD GALLERY.

THE POWER TRANSMISSION AND CENTRAL STATION PLANTS OF THE "SOCIETA GENERALE ITALIANA EDISON DI ELETTRICITA" AT MILAN.

A DESCRIPTION OF ONE OF THE FINEST AND LARGEST INSTALLATIONS IN EUROPE.

For several years, beginning in 1885, when Marcel Deprez made his classical experiments in power transmission, the officers of the Edison Electric Light Company in Milan endeavored to formulate a method for the transmission of the power of the falls of the Adda, at Paderno, 20 miles away, to their city. It was not until 1891 that a definite scheme was evolved by the lamented Galileo Ferraris, and it is only within the last few months that the plant about to be described has been put in regular commercial operation. No less than 17,300 horse-power are developed at Paderno, and the majority of this is sent directly to Milan at a pressure of 13,500 volts, to be used there for all the purposes to which electricity is applied.

The hydraulic work necessary for the development of the power was exceedingly massive and costly. About 100 yards below the famous bridge of Paderno there has been in operation for two centuries a regulating lock which controls the water in the canal parallel to the rapids. This water was taken in by a submerged dam and the regulation made through two weir gates. It was at once seen that this ancient work could be made useful in the new construction, but to convey the 1,600 cubic feet of water per second needed for the power development, the canal was not large enough nor the dam high enough. The upper part of the existing weir was therefore rebuilt, and the width of the canal enlarged from 29 feet to 43 feet in order to keep down the velocity of the stream to four and one-half feet per second. This enlargement was carried out for a distance of 2,250 feet. At this point begins the new work, the flow into the conduit being regulated by six gates, movable by hand. A few yards beyond these the

conduit, leaving to the left the canal, which winds down the picturesque valley of the Adda, enters a tunnel 345 feet long, which opens at the other end into a deep ditch 25 feet wide. This part of the work is about 750 feet long, and is succeeded by a second tunnel 890 feet in length. After this a second ditch 1,150 feet long conveys the water to the last and longest tunnel, which is no less than 3,440 feet in length. The cross-section area of this waterway is 180 square feet, and the velocity of the water in it at full flow is 8.8 feet per second. The conduit empties into an ample forebay, the formation of the valley at this point being such as to admit of the simplest and easiest construction of the power-house and penstocks. At one side of this collecting basin is the waste weir, which is formed by a flight of cyclopean stone steps, 95 feet high and nearly 100 feet wide, down which, when the works are shut down, the enormous volume of 185 cubic feet of water a second pours. The effect of the steps is, of course, to break this cataract and greatly reduce the velocity of the water and cause it to spend the enormous energy which it possesses.

Seven steel tubes lead the water from the forebay to the turbines in the power-house below. These range from three-eighths to one-half inch thick, and have an internal diameter of six feet ten inches. Each is 215 feet long, and is laid to suit the natural slope of the ground. At the top of each is a sluice gate electrically controlled from the power-house below, and at the bottom of each is a butterfly valve to control the flow into the turbine.

The discharge of the turbines is led into a large basin, which does not directly empty into the river but into a canal which is part of a lower level of the Adda Canal. This empties into the river about 400 yards below the power-house.

The net fall in the dry season amounts to 95 feet. At the heaviest freshets this is reduced to 80 feet. On account of the wide variations in the level of the tail water, all of the turbines work upon draft tubes. With the full fall and the usual height of water, the total of available power is 17,300 horse-power, which, with an efficiency of 75 per cent in the turbines, corresponds to 13,000 effective horse-power upon the shafts of the dynamos.

The station building, of which an exterior view is shown in Fig. 1, consists of one large room (shown in Fig. 2), the dimensions of which are 200 by 66 feet and 36 feet high to the ridge of the ceiling. As the illustration shows, there are at present installed in the station only four of the seven generating units which are called for in the completed plant. Each consists of a horizontal-shaft turbine of 2,160 horse-power direct-connected through a Zodel flexible joint to an alternator giving 13,500 volts directly without a step-up transformer. These turbines were the first of more than 2,000 horse-power ever constructed in Europe. They are of the inward flow type with twin wheels, the buckets being of the multiple-curve American type. The bearings are outside of the water chamber, and therefore access to them is easy. The wheels run at 180 revolutions per minute, and are controlled by governors of the Ganz type, somewhat modified to suit the special exigencies of this installation.

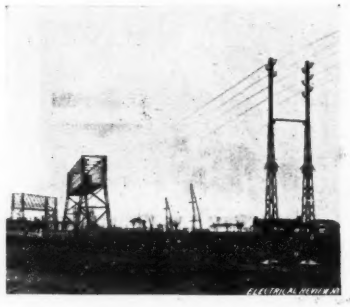


FIG. 3.—THE PADERNO-MILAN TRANSMISSION—THE LINE CROSSING A RAILWAY.

The dynamos, like all of the other electrical materials of this installation, were built by Brown, Boveri & Company, in Baden, Switzerland. At the time when the contract for building these machines was taken no dynamo had been built for a tension surpassing 6,000 volts, and it required a considerable degree of courage on the part of engineers and builders to design and put into operation machines of this size for such a high pressure as 13,500 volts. They have been entirely successful, and the elimination of the transformers renders the whole operation of the plant simple, beside making a very noticeable difference in the cost of the installation. The leads from the dynamos are run under the floor to the gallery opposite, where the switchboard is seen located against the wall. This board is built entirely of marble, porcelain and iron, and contains switches capable of breaking the full current of one of the dynamos at full voltage. From the board the wires go to an upper room where the lightning arresters are kept, and thence are led out to the line.

The line work was most carefully studied out, for the reason that it is easily the weakest point of a system of this kind, especially when worked at such high tension. Iron poles are used throughout, of a solid and at the same time ornamental construction, as may be seen from Fig. 3, which shows the line crossing some railways on the outskirts of Milan. The poles are planted in pairs six feet six inches apart, and about 195 feet apart from pair to pair. They stand 32 feet out of the ground and carry nine wires, each 0.36 inch in diameter. It will be noticed that there is a double three-phase line on one side and a single one on the other, which arrangement permits repair work to be done on the line without interruption to the service—a very important matter when the nature of the service of the Paderno plant is considered. Fig. 3 also shows two curious structures which were required by the railway company in granting permission for the line to cross its tracks. They are nothing less than iron bridges, so that it is utterly impossible for the line to fall down upon the railway tracks in any way.

The element that presented the gravest difficulty was insulation, especially under the conditions which required iron poles. Two types were adopted; those on one side of the double line being of the American "hemlet" pattern, and the others of a four-petticoat form, made by an Italian firm. All the insulators were tested under a pressure of 45,000 volts before being placed in position. The pins are of cast steel. The route of the line does not follow the roads to Paderno, but is almost straight, its total length being 20.36 miles. A right of way 10 feet wide along the line belongs to the company. At Monza a branch of the line supplies that town with current. The line comes through the streets of Milan and ends on two heavy poles in front of the station in the Porta Volta. A group of Wurts's lightning arresters protect the line at the point where it enters the building to go to the substation transformer switchboard.

At present 13 Ganz transformers are installed in a room on the ground floor, the switchboard being just above. Each of them is of 350 kilowatts capacity, and the whole battery is cooled by air circulation, a motor and fan being requisite to force the cool air through them. The station on the Porta Volta, which is both a substation and an independent generating station, is the center of distribution for the city of Milan. Its general internal arrangements are shown in Fig. 4, which gives an excellent view of the large steam-driven alternators there installed. Both the transformer current from Paderno and that generated by the steam dynamos on the premises are sent out over the transmission line as three-phase current, at 42 cycles per second and 3,600 volts tension. The switchboard permits any circuit to be fed either with the Paderno current or that generated on the premises, or the two may be worked in parallel, which has been done with great success.

The Porta Volta station contains five generating units—two alternators of 150 kilowatts each, both driven from tandem-compound engines, and three of 700 kilowatts, direct-coupled to engines of 1,000 horse-power, as shown in Fig. 4.

The distribution of which the Porta Volta station is the center is of two kinds—that for three-phase alternating current and a central network of direct current coming from a transformer substation in Radegonda street. The high-tension, tri-phase system is led out in seven conduits, which form three complete circuits of the outlying parts of the city. Two other conduits go directly across the city, and upon these are installed the substations, both for local distribution and for control of the low-tension network in their neighborhood.

Large motors are fed directly with the 3,600-volt current. For others this is transformed to 150 volts, each substation feeding a local network of cables in conduits at this pressure, and each working over a district with a radius of about 1,000 feet. The lights throughout the city are connected directly to the same lines with the motors, and it is noteworthy that both lamps and motors have worked together without the least difficulty. The distributing network is calculated to carry about 8,000 horse-power to the consumers with a mean loss of four per cent.

The second part of the distribution is carried out from the Radegonda station. Four three-phase cables bring the current at 3,600 volts to this plant, installed in the historical Edison station building which now contains much interesting modern apparatus. Its interior is well shown in Fig. 5. Two distinct classes of machinery are installed here, those for

lighting and those for railway work, both consisting, however, of synchronous motors working directly on a high-tension alternating line coupled to direct-current dynamos. There are four units of this sort, of 500 kilowatts each, for traction purposes; for lighting there are seven of 250 kilowatts and two of 60 kilowatts. Some of this apparatus was furnished by the General Electric Company, of America. The underground net-work for distribution of continuous current is a three-wire system at 110 volts, and includes the old Edison installation. The railway distribution is at 550 volts, 10 underground feeders going out to trolley lines in different parts of the city. For the street arc lighting of the city, similar units are used, the steam engines of the old plant having been replaced by three-phase motors.

Tests made upon the Paderno transmission show that the efficiency of the alternators is 94.8 per cent, and that of the transmission line 92.6 per cent. The total loss, therefore, on this long transmission is only 7.4 per cent.

The last car line in the city operated by horses was finally electrified in December, 1898, and all of the lines—a total of 60 miles of track with 240 cars—are operated from the stations described above. The work is one which reflects the highest credit upon Italian engineering skill.

General Electric Company's Stockholders' Meeting.

The annual meeting of the stockholders of the General Electric Company was held at the company's offices at Schenectady, N. Y., on May 9. The number of shares voted was 135,412, out of a total of 208,272. The old board of directors was re-elected, excepting that J. P. Ord replaces F. S. Hastings, retired. The board is now composed as follows: Gordon Abbott, Oliver Ames, C. A. Coffin, T. Jefferson Coolidge, Jr., C. H. Coster, Thomas A. Edison, George P. Gardner, Eugene Griffin, J. P. Ord, Henry L. Higginson, J. Pierpont Morgan, Robert Treat Paine, 2d, and George Foster Peabody.

The new board of directors met and adjourned, to meet in three weeks.

The Detroit street railway interests have not yet reached an agreement with the Detroit Street Railway Commission on the question of price to be paid for the lines by the city.

A Matter of Privilege—From an Old Telegrapher.

TO THE EDITOR OF ELECTRICAL REVIEW:

It is permitted to any member of a deliberative body to "rise to a personal explanation," and, as a member of the great parliament of telegraphers, I hope to be pardoned for availing myself of this privilege to say a few words touching a subject on which I am sensitive. Every once in a while some youthful telegrapher manifests an amusing measure of amiable surprise when told that I am a practical operator. Of course, there must be those in all ages and all climes who know not Joseph, but, so far as may be, I desire to make it known through the publication of the appended self-explanatory letter that I am not only an operator, but that they did not round me up with the "hams," either, when I was in the business.

WALTER P. PHILLIPS.

Bridgeport, Ct., May 3.

THE LETTER TO MR. PHILLIPS FROM PROFESSOR MORSE.

NEW YORK, April 27, 1869.

MY DEAR SIR: Ever since I received the proof of your great skill, in connection with your skillful associates, in testing rapid transmission of dispatches by the Morse telegraph system, I have been desirous of manifesting to you, and also to N. J. Snyder, Esq., of Philadelphia, some token of my great gratification on your accomplishment of feats which, so far as I know, are unexampled in the annals of telegraphy.

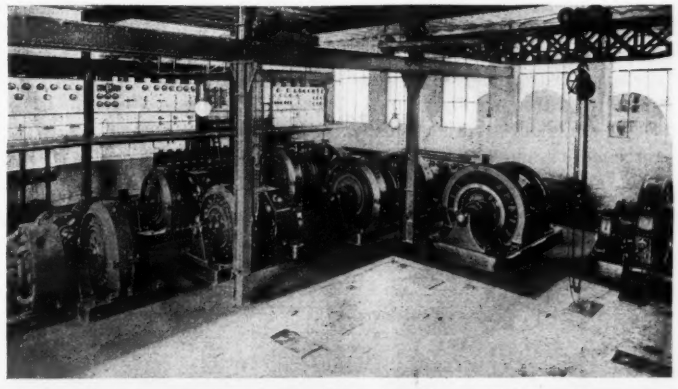
Please, therefore, accept from me, on this the seventy-eighth anniversary of my birth, the accompanying gold pencil case and pen, as a very slight and indeed inadequate expression of my admiration of your masterly performance of recording 2,731 words in one hour, a feat which I have not failed to put on record in my report to the Department of State on the telegraph apparatus of the Paris Exposition of 1867.

The necessity for exclusive attention in preparing the above-mentioned report has prevented an earlier recognition of your skill. My thanks are also due to all concerned in the satisfactory result of the test of speedy transmission. While your associates deserve high praise for their rare dexterity in manipulation, you and Mr. Snyder, I think, deserve the highest praise for the admirable and, indeed, faultless manner of recording that which was so ably transmitted.

Accept, also, the assurance of my sincere respect and esteem.

SAMUEL F. B. MORSE.

TO WALTER P. PHILLIPS, ESQ.



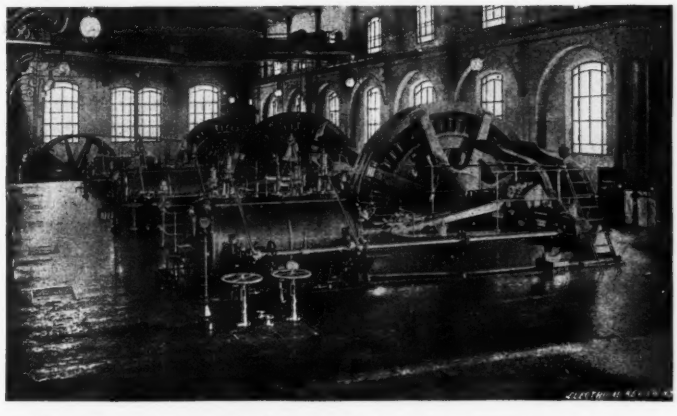


FIG. 5.—THE MILAN-PADERNO TRANSMISSION—INTERIOR VIEW OF THE RADEGONDA SUBSTATION.

FIG. 4.—THE ENGINE-ROOM OF THE PORTA VOLTA SUBSTATION.

New York Electrical Society.

At the meeting of the New York Electrical Society, held on April 27, the following new members were elected:

Seabury C. Mastick, W. T. Morrison, W. K. Sparrow, Clarence Weissblatt, Reginald Pelham Bolton, Julius A. Bychower, H. B. Palmer, A. C. Walther, Walter Hinman Beebe, Frederick Montgomery Holbrook, H. P. Merriam, E. T. Williams, Lewis B. Marks, F. E. Morgan, Arthur Williams, Solomon Davis, Charles L. Clarke.

The National Electric Light Association.

The meeting of the National Electric Light Association, which will be held in Madison Square Garden, New York city, May 23 to 25, inclusive, will be one of the most interesting in the history of that body. The programme, which was published in full in last week's issue of the ELECTRICAL REVIEW, is one of unusual merit, and can not fail to elicit discussions of a most interesting nature.

The annual meetings of this association, partaking, as they do, of the character of "experience meetings," always result in good to the profession at large, as well as to the members. There are few other industries that so completely lack the competitive feature as that of electric lighting. Established each in its own town, the central station can afford to make public its experiences, and share with its fellows the benefit of what would be, otherwise, "trade secrets." This is one of the reasons that make the conventions of the association events of real importance to the electrical profession.

This year the officers of the association are Messrs. A. M. Young, president, Waterbury, Ct.; E. W. Rollins, first vice-president, Denver, Colo.; F. A. Gilbert, second vice-president, Boston, Mass.; George F. Porter, secretary and treasurer, and C. O. Baker, Jr., master of transportation, both the latter of New York. The executive committee is composed of Messrs. John A. Seely, A. J. De Camp, E. H. Stevens, F. A. Copeland, W. W. Bean, W. McLea Walbank, Samuel Insull, Samuel Scovil and H. M. Atkinson.

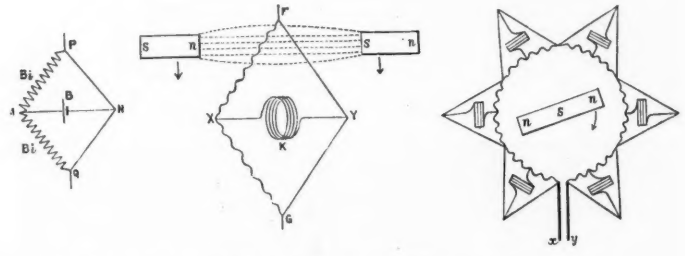
Electric Discharge Figures.

At a meeting of the Society of Arts of the Massachusetts Institute of Technology Mr. T. B. Kinraide presented a unique form of induction coil of great power invented by him. This has been especially applied to the study of discharges by the aid of photographic processes, the plate being balanced on the point of discharge in a dark room and being developed after exposure. It reveals in a striking manner the marked difference that exists between the positive and negative discharges. The apparatus was exhibited in operation and photographic plates shown. The figures thus produced by the electric discharge were of extraordinary beauty and size, the delicacy of detail being brought out by means of the lantern. It is thought they may be suggestive of forms useful to designers and decorators.

SCIENCE BREVITIES.

Low Temperature Measurements—In his presidential address before the Chemical Society, London, Professor Dewar discussed the means that might be used for measuring the range of temperature between the critical point of hydrogen and the zero of absolute temperature. The electrical resistance thermometer was of great delicacy, but it depended on a knowledge of the law connecting resistance and temperature and involved the necessity of extrapolation. At such temperatures, however, conditions occurred which could not be anticipated, and hence no confidence could be put in the results given by the curve. Platinum, for instance, which was frequently used for the construction of such thermometers, approached its zero of resistance when immersed in liquid hydrogen, and, theoretically, only required to be cooled five or six degrees further to become a perfect conductor of electricity. Such a reduction should be effected by making the hydrogen boil under exhaustion, but, in fact, the lowering of temperature indicated by the platinum thermometer in such circumstances did not exceed one degree. Hence, the platinum must have come to a limit Two pure platinum thermometers which Professor Dewar had tried both behaved in this way. Next he experimented with a resistance composed of an alloy of rhodium and platinum, which gave a different temperature altogether. According to it the boiling point of hydrogen was minus 246 degrees as against minus 238 degrees shown by the pure platinum arrangement, and it, too, failed to indicate the expected lowering under exhaustion. A thermo-junction of iron and german silver was next tried without satisfactory results, and another junction of lead and iridium platinum proved equally ineffective. Thus he was brought to an air thermometer and the use of hydrogen itself, under diminished pressure, to determine its own boiling point. In the instrument he had constructed the gas had a tension of 273 millimeters at the temperature of melting ice, so that a difference of one millimeter corresponded to one degree of temperature. The boiling point of hydrogen was by this thermometer given as about minus 252 degrees, but various corrections had to be made, and in particular the possibility of the hydrogen being contaminated with a slight impurity of air or oxygen allowed for, so that it was uncertain what exactly was the true boiling point. Assuming it to be minus 252 degrees, or 21 degrees on the absolute scale, Professor Dewar went on to illustrate the difficulties of nearer approach to the absolute zero itself. By exhaustion the experimenter could not practically get more than six degrees lower, and at that point he was barred and blocked with no means of bridging over the remaining 15 degrees. Even supposing that a new substance was discovered as volatile in comparison with hydrogen as hydrogen was in comparison with nitrogen, that under exhaustion would only give a temperature three and one-half degrees above the zero, and it would require a second hypothetical substance as volatile compared with the first as the first was compared with hydrogen to enable the experimenter to come near the extreme of temperature he is aiming at.

A Brushless Direct-Current Dynamo—An exceedingly curious design for a direct-current dynamo without commutation apparatus is communicated to our London namesake by Mr. Albert Campbell. It has generally been considered that it is impossible to construct a dynamo to give current of a single direction without sliding contacts of some sort. Mr. Campbell imagines some arrangements which show that commutation can be obtained without any sliding contact whatever, and with all the parts of the conducting circuit rigidly connected together. Fig. 1 shows an ordinary Wheatstone bridge in which B is a battery and the four arms are of equal non-inductive resistance. Two of the arms, represented by the waving lines in the diagram, are supposed to be of pure bismuth. Now, since the bridge is balanced, there will be no potential difference between the points P and Q, but if a strong magnetic field is allowed to cut alternately the two bismuth arms, the bridge is thrown out of balance (by the increased resistance of this metal when permeated by a magnetic field) and alternating differences of potential will be set up between P and Q. Now, passing to the case shown in Fig. 2, the battery is replaced by a coil K, with its plane perpendicular to the plane of the paper. If a magnetic flux, shown in the figure, moves downwards, and is followed at a distance equal to F G by a series of similar fluxes, an alternating electromotive force will be set up in the coil K. Owing, however, to the action of the bismuth arms, a unidirectional potential difference would be produced from F to G, and a rectified current may be drawn from these two points. To obtain a uniform continuous current it would only be necessary to connect in series a sufficient number of such elements in some such manner as is shown in Fig. 3. The efficiency of the machine is, of course, small.



FIGS. 1, 2 AND 3.—A DIRECT-CURRENT DYNAMO WITHOUT BRUSHES.

Electro-static Lines of Force—At the last meeting of the Académie des Sciences, M. Boudreaux explained his method for obtaining diagrams of the lines of force in an electro-static field. Up to this time experiments in this direction have been unsatisfactory, owing to the fact that metal filings have been used for the purpose, which are at first attracted and then repelled by the charged conductors. M. Boudreaux employs a semi-conducting substance, such as diamidophenol, which is formed of minute crystalline needles. A plate of glass is placed horizontally over the charged conductors, around which the electro-static field is manifest, and the powder is sprinkled uniformly over the plate. Upon tapping the glass the powder takes a certain position, giving a diagram similar to that obtained with iron filings in a magnetic field, and shows clearly the distribution of the electro-static lines of force. These figures may be fixed by sifting powdered photographic varnish over the plate and then heating it.

Our Name Contest.

Great interest has been manifested in the ELECTRICAL REVIEW'S offer of prizes for a suitable name for the self-contained, electrically propelled vehicle. All sorts of suggestions have been received, some learned, some facetious, some cranky, some wise and some otherwise. Several letters have had an element of humor in them, for example:

Gentlemen—I suggest following names:
For open passenger vehicles...Electrocart.
" closed " " ...Electrobus.
" open vehicles for goods ..Electrodrag.
" closed " " " ...Electrovan.
Please send me the $10, and enter my subscription for 1900.

One enthusiastic correspondent suggests the name of "Shipton," "in memory of that very old lady who, more than 200 years ago, discovered that some day 'carriages without horses should go.'"

Another correspondent informs us that "the prefix 'auto,' as used in 'automobile,' 'automotor,' etc., is, strictly speaking, incorrect as well as superfluous, and therefore objectionable; beside which it does not distinguish between road vehicles propelled by electric and those operated by compressed air, petroleum or other power."

Still another correspondent, doubtless thinking of the fat-tired wheels of New York electric cabs, suggests the title "Dough-nut Wagon." Here are a few suggestions of an alleged facetious nature:

Bacrotom,	Electragon,
Aut,	Autopropelectric,
Accelawatt,	Equine-nit,
Trolley-Ho,	Autogo.

In a recent conversation with a representative of the ELECTRICAL REVIEW, Mr. T. A. Edison said that "automobile" is a good word, and one that he thinks will survive, as it is comprehensive, descriptive, and, to some degree, international.

The conditions of the contest are very simple. Anybody may send a suggestion for a name to the Name Committee The contest will be closed on May 27, and, if the committee can finish the arduous labors of selection in time, the result will be announced in the issue of May 31. The first prize is $10 and a year's subscription to the ELECTRICAL REVIEW; the second, $5 and a year's subscription, and the third, the subscription alone.

Marconi Antedated.

Newell Little: Is this wireless telegraphy practicable?

Newsome Moore: Why, sure! The yellow journals used it all through the late war.—*Life.*

The Niagara Falls Belt Line Electric Railways.

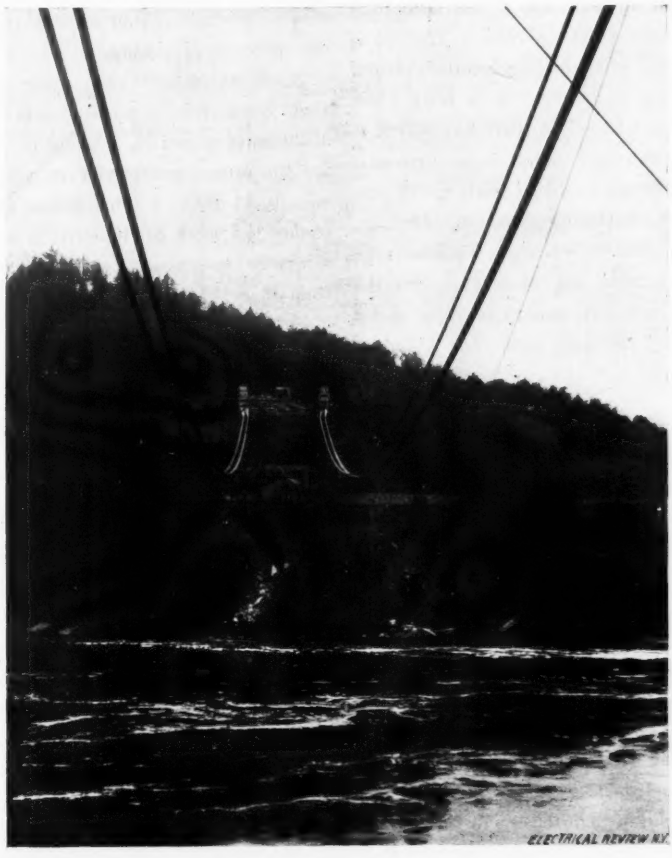
The International Traction Company, of Niagara Falls, having acquired the franchise rights of the Lewiston Connecting Bridge Company and the Queenston Heights Bridge Company, new interest is aroused in the construction of the suspension bridge over the Niagara River between Lewiston, N. Y., and Queenston, Ont. The same company having also become the owners of the upper steel arch bridge property, close to the Falls, and the Niagara Falls Park and River Railway on the Canadian side of the river, with a prospective connection of their own between the upper arch and the new suspension bridge along the New York side, it is evident that it can operate a belt line about this most beautiful part of the Niagara River without the cooperation of any other company.

The site of the new suspension bridge is identical with that of an early enterprise of the locality, a suspension bridge having been erected on the same site in 1851 – 52. But that old-time structure was far ahead of the demands of travel for business or scenic purposes, and after it was destroyed by a wind-storm on the morning of February 1, 1864, it was never rebuilt. Previous to the wrecking of the bridge there had been a great flow of ice down the gorge, and the bridge officials, fearing a jam of mighty proportions beneath the bridge, ordered that the guys of the structure be loosened and carried up out of the path of the ice. This was done and the ice passed down the river to the lake without doing much damage. The bridge guys were not, however, replaced immediately, and on the morning referred to a strong gale blew down the river. It caught the bridge full on the side and before the wind went down a portion of the superstructure had been torn away and fallen into the river. The bridge was an unprofitable investment, and the companies in control were not sufficiently strong to rebuild it, so piece by piece for years, it dropped away, until at the time the old cables were cut away to make room for the new work there was but a small part of the old structure left as a landmark.

Before last Winter set in the approaches to the bridge on both the New York and Canadian sides of the river had been completed, with the exception of track laying. Each of these approaches is built for double tracks and each leads up to the bridge from the north side. The approach on the New York side is about 800 feet long and that on the Canadian side is about 1,000 feet long. The New York approach extends along the tracks of the Gorge road, and for its entire length a face wall has been built. At its highest point this face wall is 19 feet high. It drops for 600 feet at a grade of one per cent, and for about 200 feet at a grade of two per cent. This wall and approach practically form the landing place of the bridge. The Canadian approach is the old approach reexcavated. The height of the floor of the bridge above the Gorge road tracks will be about 15 feet, while the height of the bridge over the water will be about 65 feet. In this construction quite a notable departure is made as compared with the greater suspension bridges which once stood further up the river. It will be recalled that the superstructure of those bridges were even with the tops of the cliffs, but in this new bridge the floor will be midway between the surface of the water and the top of the bank.

The towers of the new bridge were also completed last Fall. They are four in number, two on each side of the river. Those on the New York side stand 28 feet back from the edge of the bluff, are 26 feet high and have bases 13 feet square. The Canadian towers stand back 15 feet from the bluff, are 18 feet high and have bases 12 feet square. The stone of the old towers was used in the foundation for the new ones, and the old inscription stones have been preserved and given place in the new structures.

The length of the cable span on this new bridge will be 1,040 feet, while the span of the stiffening truss will be 800 feet. The width of the bridge from center to center of trusses will be 28 feet, and the clear width of the roadway 25 feet. This will afford space for a single trolley track and room for vehicles to pass on either side of the car track. As the bridge is quite a distance from the route of foot travel it is not expected that the number of pedestrians to cross will be very great. The floor will be of two inch oak plank, laid crosswise. The stiffening truss will extend about four feet above the floor level, and the only railings will be of light strips of iron flats reinforced with oak half rounds. The superstructure will be supported by four cables, each composed of 14 two and one-quarter inch galvanized cast-steel wire ropes. The same ropes formerly composed the cables of the upper suspension bridge at Niagara Falls. This latter bridge was 1,268 feet from cliff to cliff, and the anchorages of the cables were some distance back from the towers. This made a great length of cable, and it has been found possible to cut the ropes of these old cables in half, and in this form utilize them on the new suspension bridge. However, when so cut they do not entirely fill out the entire cable span and reach back to the anchorages, and for this reason eye-bars are used for about 75 feet at each end. The anchorages are built in solid rock about 150 feet back from the bluff, the shafts being filled with concrete. The versed sine of the cables is 87 feet. They were all strung by the last week in April, 1899, and preparations made for the erection of the superstructure, which will be of steel, the contract for this portion of the work being in the hands of the New Jersey Steel and Iron Company.



THE NIAGARA BELT LINE. CABLES FOR THE NEW BRIDGE NEAR LEWISTON.

At each end of the suspended span and the land approaches there will be short approach spans to the bridge. On the New York side this will be 34 feet 6 inches long, and on the Canadian side 19 feet 6 inches. The weight of the metal to be placed in the bridge will be about 800 tons, the cables weighing 200 tons. The capacity of the bridge will be such that it will easily take care of the heaviest trolley cars likely to be run by the International Traction Company, together with a uniformly distributed load of 40 pounds to the square foot over the entire structure.

Mr. R. S. Buck is the engineer of the bridge, and Mr. L. L. Buck is the consulting engineer.

It is expected that rapid progress will be made in the erection during the months of May and June. The steel for the bridge will be delivered at the New York end of the structure. Between the cables a platform has been swung, and as fast as a section of the bridge is placed this platform will be moved out across the river until the final section is placed, after which the riveting will be completed. The bridge will be completed in time for the Summer travel of 1899, and if the Gorge road is reopened for traffic, it will be possible to operate a belt line about the gorge, providing connection is made between the tracks of the Niagara Falls & Suspension Bridge Railway and the tracks of the Niagara Falls Park and River Railway at the upper steel arch bridge in the city of Niagara Falls. A bill to make this possible through the construction of surface railway tracks along the riverway, a part of the New York State Reservation, has been passed by the legislature, and is now in the hands of Governor Roosevelt. The distance over the reservation property along which it is proposed to construct these tracts is one block on the east side of Prospect Park, Niagara's great free pleasure ground.

Electrical Review

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News, Subscriptions and Advertisements

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week, although it is occasionally possible to get in matter received on Monday.

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The merry war among the gas companies in New York city goes on apace. The latest quotation is 50 cents per 1,000 feet for gas, with prospects of a further reduction. Meanwhile the electric light companies are supplying thousands of patrons and waiting to see what will happen next.

Acetylene has made little progress in car lighting, but it has been used to some extent abroad. That it is not the safest of illuminants is proved by an occurrence on a train from Aix la-Chapelle to Berlin on March 4. An acetylene lamp in a first-class apartment exploded with great violence, shattering glass, etc. Luckily, says the *Koelnische Volkszeitung*, there were no passengers in the compartment, otherwise they would almost certainly have been killed or injured.

It is stated that the Fifth avenue stage line, in New York, has passed into the ownership of a syndicate controlling the Metropolitan Street Railway Company, and that the ancient vehicles will be replaced with roomy, comfortable and rapid automobiles. For some time past the question of thus rehabilitating the dilapidated stage line has been discussed, and, now that it is to be done, no one will regret the passing of the horse from New York's finest thoroughfare. The electrification of the stages was advised by the ELECTRICAL REVIEW months ago, and it is pleasant to see good advice followed.

The soaring price of copper has almost paralyzed several industries in which that metal is largely used. If the price of copper wire stays where it is now for any length of time it will afford an admirable opportunity for commercial experiments on other metals as conductors for electric current. Iron wire, having about one-sixth the conductivity of copper, can now be bought at just one-sixth the price of copper wire. Large sections of steel, rails, etc., can be bought at about one twentieth the cost of copper, or, roughly speaking, the same money will buy about three times more conductivity in steel than in copper.

Of course, the cost of bonding, of insulation and of space to contain the larger section of steel all tend to bring up the cost of such conductors to a point level with that of copper. But there is a field for the steel conductor, and a growing one, in heavy railway work. In this, with moderate potentials and no necessity for an insulated conductor, iron or steel rods or rails serve admirably.

It was stated, more than a year ago, that commercially pure aluminum, at 29 cents a pound, is equal in cost for the same conductivity to copper wire at 14 cents. This means that to-day the same conductivity is considerably less costly in aluminum than in copper.

THE ELECTRICAL EXHIBITION.

The Electrical Exhibition, which opened under promising auspices at Madison Square Garden, New York city, last Monday evening, bids fair to be as successful and interesting as any of its predecessors. It is rather a large undertaking to install the exhibits and put in operation the multitude of electrical and mechanical appliances that are shown under the ample roof of the Garden this year, and especially so when only one week's time for preparation is available. The successful opening of the exhibition, with a large majority of the exhibits completed, speaks well for the industry and energy of the gentlemen upon whom the difficult task of its organization and completion has fallen.

There is a perennial public interest in electricity and its applications. The crowds that will flock to this year's show will see few spectacular exhibits, but can not fail to be impressed with the solid and stable character of electrical work as revealed by the specimens shown. It is only once in a great while, nowadays, that the old expression concerning the infancy of electricity is heard. The sturdiness of its growth and the perfection of its methods may both be well seen at the exhibition this year. This is especially true of the new art of automobile-making. American engineers have a just right to pride in their achievements in this new and most important direction.

The show is a good one; its surroundings are handsome and adequate; its success is evidently assured.

A LIQUID INTERRUPTER THEORY.

TO THE EDITOR OF ELECTRICAL REVIEW:

The electrolytic interrupter described by E. W. Caldwell, in the ELECTRICAL REVIEW of May 3, is a very ingenious device. He says: "It is probable that electrolytic action in this instrument is not at all essential to its operation, and that its action is entirely thermal."

Here Mr. Caldwell makes a serious mistake. That the breaking of the circuit is thermal one can see at a glance. But the sharpness of the break is by no means due to thermal action. The action here is purely electrolytic, and depends on the fact that the cell containing a solution of sulphuric acid, and in which hydrogen and oxygen are liberated, is a polarization cell, and, as such, acts as a remarkably good condensance. Upon this alone depends the sharpness of the break.

It appears that Mr. Caldwell is not aware of this fact, otherwise he would not have used metallic mercury.

Again, the expression "suitable electrodes" may mean an infinite number of things. If he used a copper anode in his experiment, with a solution of copper sulphate, the results would not be very gratifying. In a cell of this kind—one in which the metal of the salt in solution is deposited on the cathode and the SO_4 ion liberates or attacks an atom of copper of the anode forming a molecule of copper sulphate, which dissolves in the liquid—there is no polarization, and the cell will not act as a condensance. Even where there is not an anode of copper, but where metallic copper is deposited, the polarization, and consequently the condensance, is so small as to give poor results.

This, I think, will explain Mr. Caldwell's experience with copper sulphate solution. So far as the electrolyte is concerned, that used by Mr. Caldwell—sulphuric acid of about 24 degrees Beaumé—is as good a one as can be desired. It is useless to experiment with solutions of metallic salts, for the reason pointed out.

HARRIS GOLDSTEIN.

New York, May 6.

SOME EXPERIMENTS WITH THE CALDWELL INTERRUPTER.

BY CHARLES T. CHILD.

A number of experiments were undertaken, using the apparatus described by Mr. E. W. Caldwell in the last number of the ELECTRICAL REVIEW, to determine the nature of the phenomena exhibited, and, if possible, to form a basis for some theory of the action of the apparatus.

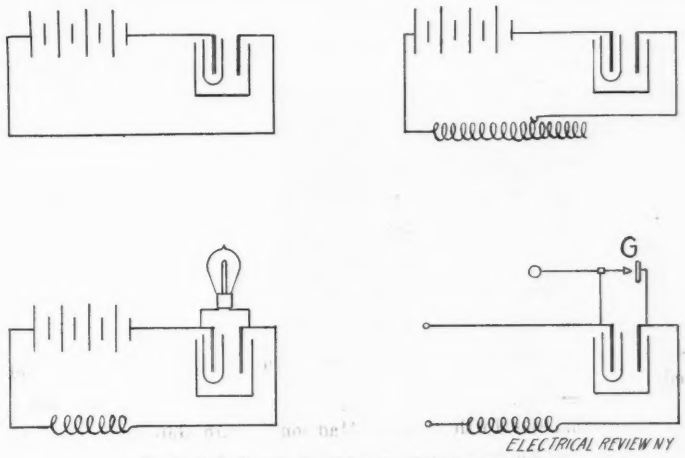
The interrupter consisted of a glass jar having a central lead electrode and covered with a varnished wooden top, through which a number of test tubes projected into the liquid electrolyte. Each of these tubes was punctured with one or more holes, ranging in size from one thirty-second to one-eighth inch, and one of them was provided with a sort of nipple of glass tubing, about one-sixteenth-inch bore and one fourth inch long.

A battery of 10 accumulators, connected directly through the instrument (Fig. 1), gave negative results. In certain tubes there was observed an occasional bubble, accompanied by a clicking noise. Upon the introduction of a variable inductance in the circuit (Fig. 2), it was found that, at a certain point, the clicks became sharper, and that when a little more inductance was included the apparatus suddenly began to interrupt. The addition of inductance *increased* the frequency, this rule holding through the limited range of inductance available. It would be very interesting to discover how the frequency varies with the self induction of the circuit through a large range, and also to note the effect of a variable capacity upon it.

With increased electro-motive force the frequency rises, both the pitch and loudness of the tone emitted by the interrupter rising.

If the interrupter is paralelled with a high resistance shunt, such as an incandescent lamp (Fig. 3), two effects are noticeable: The frequency is diminished, the action of the interrupter becomes less violent, and the lighting of the lamp shows the existence of a high electro-motive force around the interrupter. Using the primary of a large induction coil as the inductance, and a current of about six or seven amperes at 110 volts, the electro-motive force developed across the interrupter was, judging from its action on lamps, etc, probably more than 1,000 volts. Incandescent lamps were blown to pieces by it with a sharp report. The arrangement shown in Fig. 4, in which a spark-gap G was shunted around the interrupter, was also tried, the striking distance, under the conditions described above, being about one-sixteenth of an inch.

During the operation of the instrument the orifice in the test tube is filled with a pink blaze, and streams of small bubbles are violently projected from it. This is true even if the hole in the tube is at the bottom,



FIGS. 1, 2, 3 AND 4.—"LIQUID INTERRUPTER."

as shown at *a* in Fig. 5. With this tube the bubbles are shot down two or three inches into the liquid.

The effect of the instrument upon an induction coil is quite different from that produced by Wehnelt's interrupter. When the latter is used the secondary discharge seems to be almost purely alternating, a roaring arc playing across the terminals. With Caldwell's interrupter the discharge seems to be unidirectional, a shower of blue sparks of great energy being maintained by the secondary.

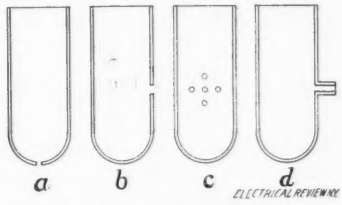


FIG. 5.—"LIQUID INTERRUPTER."

It is, perhaps, premature to advance any theory for this interrupter, but an observation of its working leads almost irresistibly to the conclusion that the phenomena exhibited are only in part due to thermal effects. It can be imagined that some such action, as is shown diagrammatically in Fig. 6, takes place. Here the sketches represent cross-sections of the orifice in the glass tube. At *a* a bubble is forming in the middle of the cylindrical filament of liquid connecting the two sides of the apparatus. The middle section of this fluid cylinder, not being cooled by conduction so rapidly as the surface in contact with the glass, is rapidly brought up to the boiling point. Of course, the formation of the bubble in the already hot liquid narrows its cross-section and accelerates the complete separation of the thread of liquid, as at *b*. But when this separation is accomplished, the inductance of the circuit causes an accumulation of potential, the value of which is determined by a number of causes, at the faces of the separated liquid. There is thus established an electro-static pressure tending to reunite the liquid thread, and this may be very great if the separation is small and the potential difference of the order of thousands of volts.

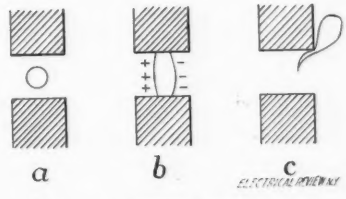


FIG. 6.—"LIQUID INTERRUPTER."

Hence, the liquid is violently reunited, squeezing the bubble out of the orifice somewhat, as shown at *c*, and all is ready for the next cycle.

It seems reasonably evident that electrolysis has nothing to do with the action, since, with metallic mercury as the liquid, the interrupter works, but so violently as to destroy itself in a few seconds.

This roughly tentative theory is suggested simply as worthy of consideration until further and accurate experiment shall show more clearly the principle underlying the extremely interesting phenomena presented by this apparatus.

THE LIQUID INTERRUPTER.

Referring to the liquid interrupter, of which a description was given in the last issue of the ELECTRICAL REVIEW, Professor Elihu Thomson has written an interesting letter, from which the following extracts are taken:

"TO THE EDITOR OF ELECTRICAL REVIEW:

"Curiously enough . . . I had been conversant with the existence of the liquid interrupter. . . . I had also made some experiments with it, and the theory of action which I have formulated is that a short column of liquid electrolyte in the constricted opening of the interrupter becomes heated to the point of vaporization at its narrowest section. The appearance of the first vapor, however, restricts the section, the inductance in series tends to keep the current constant, which forces the liquid to vaporize over the whole of the remaining section, and this quite rapidly or almost instantly, as is the case with the liquid in contact with the platinum of the Wehnelt interrupter. The interrupter is like the Wehnelt, except that the constricted anode has a liquid instead of the platinum surface. The efficiency can hardly be as great as that of the Wehnelt, and the indications in my experiments are that there is more waste in the liquid form. This would naturally come as a consequence of the fact that in the Wehnelt interrupter the resistance of the liquid when the current is passing is that of a gradually increasing section from the platinum outward towards the cathode, while in the liquid interrupter the gradually increasing section exists in both directions, backward towards the liquid anode and forward towards the cathode.

I notice in the discussion of the Wehnelt interrupter abroad that there has been a tendency to attribute the action to a kind of resonance, as if the interrupter itself had a capacity. I can not see the slightest foundation for this view in either the Wehnelt form or the liquid form, nor do I see the slightest necessity for any such assumption of capacity in the interrupter, all the effects produced being easily understood from a careful consideration of the actions which occur, especially in view of the explanation which I have given as to the probable theory of the actions.

The better form of "liquid" interrupter, so far as the avoidance of undue liquid resistance is concerned, would naturally be one in which the opening is made with sharp edges; i. e., that the interrupting column shall be quite short and that the section of the liquid shall increase as rapidly as possible from the interrupting section in both directions.

ELIHU THOMSON.

Lynn, Mass., May 4.

BRIG.-GEN. IRVING HALE, U. S. V.

CAREER OF AN ELECTRICAL MAN WITH OUR ARMY IN THE PHILIPPINES.

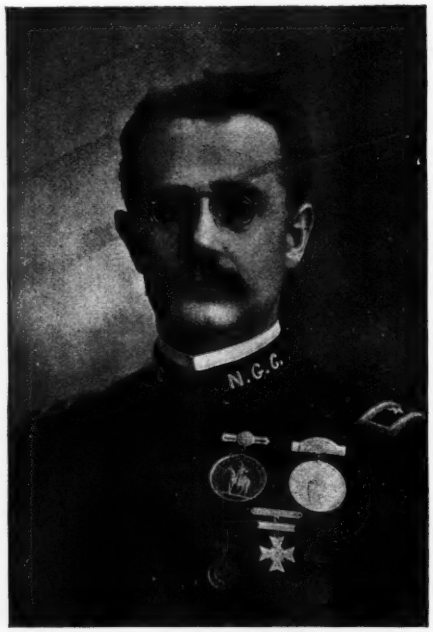
Brig.-Gen. Irving Hale, whose name has been frequently mentioned in a complimentary manner in the war dispatches from the Philippines, is a trained and scientific soldier, a graduate of the West Point Military Academy and a prominent member of the electrical fraternity. He was born at North Bloomfield, N.Y., in 1861, and came of old Revolutionary stock. His father, Horace M. Hale, LL. D., moved to Colorado while his son was a child. In 1877 he was graduated at the head of his class in the East Denver High School. Three years later he went to West Point, and was graduated at the head of the class of 1884, which furnished the unusual number of seven second lieutenants to the engineers' corps.

While at West Point young Hale expressed his determination to take the highest stand ever attained at the academy. This he succeeded in accomplishing by earning a percentage of 2070.4 out of a possible 2075 for the four years' course, which still stands as the record at the military academy. Hale was for a part of his course, under the instruction of Brig.-Gen. Eugene Griffin, United States Volunteer Engineers, now first vice-president of the General Electric Company, but then serving as assistant professor of civil and military engineering at the military academy. Lieutenant Hale's first station was at Willets Point, where he took the course in the torpedo school. While there he met a daughter of the commandant of the post, General King, whom he afterward married. He was later detailed as instructor in the department of engineering at the military academy, and served for some time in this capacity.

In 1888 Hale scored a triumph which endeared him to the enlisted men, when he won the gold medal at a competition held at Fort Niagara for known distance and skirmish firing. Thus, he was not only the best scholar in the army, but at that time the best shot.

Hale resigned from the army in 1889 to enter the service of the Edison General Electric Company, at Denver, soon becoming general manager for Colorado, Wyoming, Utah and New Mexico. Upon the consolidation of the Edison General Electric Company with the Thomson-Houston Electric Company, forming the General Electric Company, he became manager of the Denver office of the General Electric Company, and remained in that position up to the opening of the Spanish war last year.

Two years ago Gov. Alva Adams appointed him colonel in the Colorado National Guard, and in December of the same year Hale succeeded Brigadier General Brooks, who had died. General Hale went to Manila last Summer as colonel of the First Colorado Volunteers, and, on being recommended for promotion by Generals Merritt and Greene for "gallant and distinguished services," President McKinley gave him a brigadier-general's commission



BRIG.-GEN. IRVING HALE, U. S. V.

While directing the advance of his brigade on Polo Hale was wounded, and for a brief time lay in the hospital. But he was soon back again at the front. In the recent fighting near Calumpit General Hale was engaged in a flanking movement and forced the Chico River under a heavy fire, Hale plunging into the stream to his neck and leading his men to the charge. Their loss was the heaviest of the day. General Hale is reported to have been wounded again on April 26.

We publish herewith, through the courtesy of *Collier's Weekly*, an excellent portrait of General Hale.

The directors of the Syracuse, N.Y., Rapid Transit Railway have voted to expend about $350,000 in extending and improving the electric street-railway system. The purchase of the Syracuse & East Side Railway, capitalized at $250,000, which has been opposed in the courts by a faction of rapid transit directors, was authorized.

WIRELESS TELEGRAPHY.

BY ALFRED G. DELL.

Wireless telegraphy having attracted the attention of the scientific world, I think the following experiments, made some five years ago, will be of some interest. I made them, using what is called a Hertzian receiving circle or a detector of the waves.

They were made in a dwelling-house, and generally the sparking circle was used in rooms away from the wave producer.

That they were true electric waves was clearly proved by reflection, interference, etc.

The experiments were carried on at night, and all the phenomena noted.

I will state that I made no effort to bring the circles used as detectors to resonance with the wave producer, after having found by trial that all sizes of circles sparked equally well, excepting those that were unusually small or large. I was puzzled at one time to account for the reason why the receiving circles worked better on some nights than others, until I noticed that the nights on which they worked poorly were damp and foggy, it being at that time in the Summer when the windows are open. They not only appeared, but did, beyond a question, work better on cool, dry nights, when there was little moisture in the atmosphere, than in rainy weather.

I also found there was a slight reflection at all walls, no difference how thin, the strength of the waves falling off on the opposite sides of the walls. I found that, when I set up a large zinc sheet used generally for the interference phenomena, on placing a circle directly behind the sheet, with the plane of the circle perpendicular to it and the spark-gap of the circle adjusted closer, I could obtain sparks, although I protected it from any outside reflection from the walls of the room; but upon grounding the zinc sheet by attaching a ground wire directly opposite to the circle on the side next to the wave-producer, I failed to obtain any sparking in the circle.

When the circle was placed close to the zinc sheet, perpendicular to it as described above, on the side towards the wave producer, the strength of the waves fell off when the sheet was grounded on the opposite side.

When the sheet was not grounded the waves did not pass through the sheet, but part of the strength of the waves went towards charging the sheet and then they were radiated in all directions, the sheet becoming a secondary source. A large portion of the waves was also reflected from the sheet.

The inferences of the experiments are obvious: that in wireless telegraphy, if the weather is damp or rainy, the strength of the waves will fall off, and any obstruction will also reduce their strength.

The waves move in straight lines when there is no interference, radiating from the producer in all directions, stronger in some directions than others, and would not follow the rotundity of the earth, but would pass out into space, becoming weaker as they recede from their source. I failed to obtain diffraction effects of any account. I always found the waves in long receiving wires divided themselves into segments, the greatest energy always appearing at a loop half way between two nodes, the energy diminishing each way from a loop as a node was approached, and falling off to almost nothing at a node. If the coherer is placed at or near a node, the action of the coherer would be considerably less than when placed at or near a loop.

I regard wireless telegraphy of little commercial value, as I do not see why it should be used where wire connections can be made, wire telegraphy being almost perfect, both as regards secrecy and the great ease of sending and receiving both ways, and also the speed with which it can be accomplished.

The following is an approximate formula for finding the height to which the sender and receiver must be elevated to be in sight of each other. It is very simple. Let $r\ m$ be the radius of the earth in feet, it being regarded as a perfect sphere. Let $d\ m$ be the distance in feet in a straight line between the elevated plates.

Let $h\ m$ be the height in feet of sender and receiver, m in all cases equal to 5,280.

$$h\,m = \left(r^2\,m^2 + \frac{d^2\,m^2}{4}\right)^{\frac{1}{2}} - r\,m$$

$$h\,m = \frac{d^2\,m}{8\,r} - \frac{d^4\,m}{128\,r^3} + \ \ldots$$

$h\,m = \dfrac{d^2\,m}{8\,r}$, all terms after the first being small.

Of course, the above is only an approximation.

A Home-Made Projecting Arc Lamp.

Many amateurs, students and teachers of electricity like to make small pieces of apparatus in their own shops. The designs here shown are for a focussing arc lamp, to be used in a projecting lantern or in a searchlight, and which can be made by the amateur at very small cost and with simple tools.

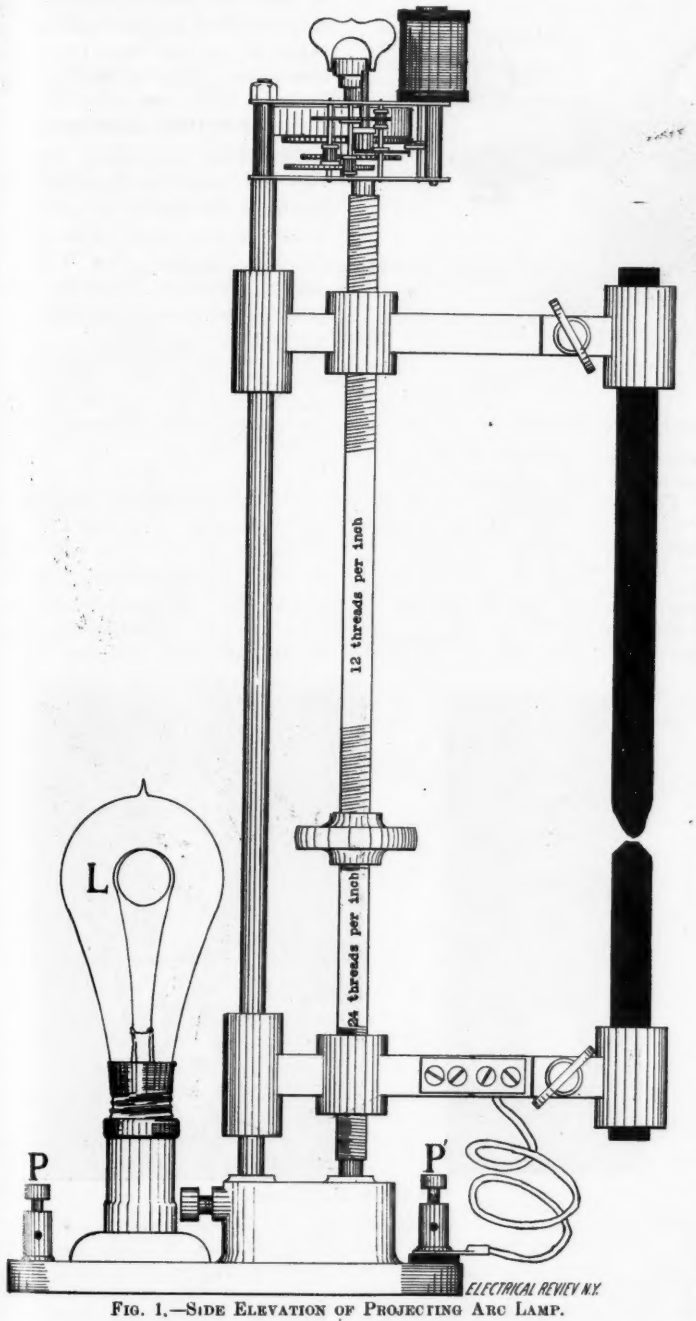


FIG. 1.—SIDE ELEVATION OF PROJECTING ARC LAMP.

Fig. 1 shows a sketch side elevation of the complete lamp, and Fig. 2 a plan view of it. The base is made of cast-iron, the pattern being so simple that it can be easily whittled out. It is better to make it as large and heavy as the situation of the lamp will permit, to secure steadiness. About six inches by four inches by one-half inch thick will be found to be the best size.

In the upwardly projecting part of this are drilled three one-fourth-inch holes, to carry the two back rods of the lamp and the screw which feeds the carbon-holders. The relative places of these are determined by the clockwork which actuates the feed. This is taken from a small, round, one-day clock, such as is commonly sold for about 65 cents. The reducing gear, for driving the hour hand, is taken off, and the main arbor of the clock—that on which the minute hand was mounted—is fitted tightly into a hole in the end of a double-threaded feed-screw. This should be about 12½ inches long over all, and made from three-eighth stock. On the upper end, that which receives the clock arbor, there is cut a right-handed screw, 12 threads per inch, the threaded portion being seven and one-half inches long. At the other end it is turned down to one-fourth inch to fit in the hole in the base casting. On the lower end a left-handed screw, 24 threads per inch, is cut, the threads covering three and one-half inches.

The back rods are of three-eighth-inch Stubs's steel wire. At their lower ends they are fitted into holes in the base, and at the upper end they are reduced to one-fourth inch, to form a shoulder for the clockwork, and carried up through holes in the brass frame of the latter, as clearly shown in the drawings. The distance apart of these rods is determined by the clockwork, of course. In that shown in the drawing, which is a common type, the back rods can be placed one and one-fourth inches apart (centers). The drawing shows them set into the base with set screws. This is an unnecessary refinement, however, as they may be made a tight fit and driven in.

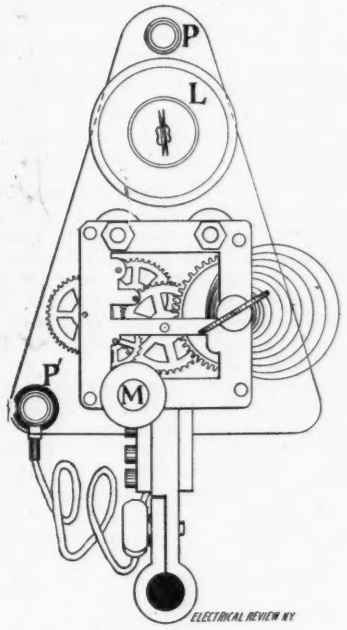


FIG. 2.—PLAN OF PROJECTING ARC LAMP.

On these two back rods slide the carbon-holders. These are of brass, T-shaped and threaded to fit the right and left screws. On the middle of the screw is set a thumb-wheel, about one and one-fourth inches in diameter, which is used to set the apparatus and also to start the arc. The center of this thumb-wheel should be four inches above the end of the lower threaded part and eight inches below the end of the upper screw. In trimming the lamp the points of the carbons should be made to meet exactly opposite the wheel, when it will be found that the arc will remain in position as they are consumed. It will be noticed that the lower carbon-holder is split apart and held together by screws and strips of vulcabeston, so that the lower carbon is insulated from the frame of the lamp.

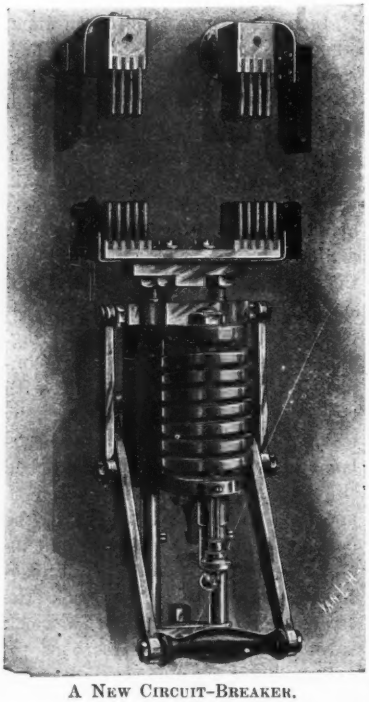
The regulating mechanism is very simple. An incandescent lamp L, of 16 candle-power at 110 volts, is mounted on the base. Through a hole in the front of the clockwork frame is inserted a prolongation of the core of the magnet M. This is made of a piece of soft iron rod, three-eighths inch in diameter and two and one-fourth inches long. It is turned down to one-fourth inch, where it goes through the clock frame. Between the fiber heads on the upper part are wound 200 turns of No. 22 Brown & Sharpe gauge magnet wire. This magnet is so placed that it attracts a small piece of iron wire soldered on the escapement lever of the clockwork. The escapement is filed off at one end, so that when the lever is held back by a small spring (not shown in the drawings) it prevents the clockwork from turning. The magnet M and lamp L are connected in series and in parallel with the arc. The latter is "struck" by means of the thumb-wheel, the carbons being screwed together and then slightly separated. As the length and resistance of the arc increase, the current through the shunt circuit increases until the magnet M overcomes the spring which holds back the escapement lever, and the clock turns. This screws the carbons together, until the decreasing current in the shunt circuit releases the escapement and stops the clock.

Regulation is effected by the tension of the spring. The lamp works well with 110-volt current if a resistance is included in series with it. This should be made of about 14-gauge steel wire, wound up in helix form to save space. About 500 feet of it will suffice. Cored carbons, one-half inch in diameter, should be used with a current of about 10 amperes.

A New Circuit-Breaker Design.

The illustration shows a type of circuit-breaker that combines a number of points of novelty and merit. It is adapted to be mounted on the face of a switchboard or to remain on the slate base upon which it is assembled for shipment.

The moving parts, which are released by the action of too heavy a current, move in a vertical line, and no part of the instrument swings out from the base or switchboard. Through the use of vertical guide-rods, which carry the contact jaws, an excellent alignment is obtained, and no hinges or pivots are used in the parts which are to be kept in line. The contact surfaces are split-leaf copper springs, while removable carbon blocks take the arcs made on opening or closing the circuit. Adjustment of the instrument to work at the desired current value is accomplished by raising or lowering the iron core of the solenoid by a screw. All the brass and copper parts, which are of large carrying capacity, are polished and the main body of the instrument is nickel-plated. It is



A NEW CIRCUIT-BREAKER.

made up in sizes ranging from 10 to 3,000 amperes capacity, single or double pole.

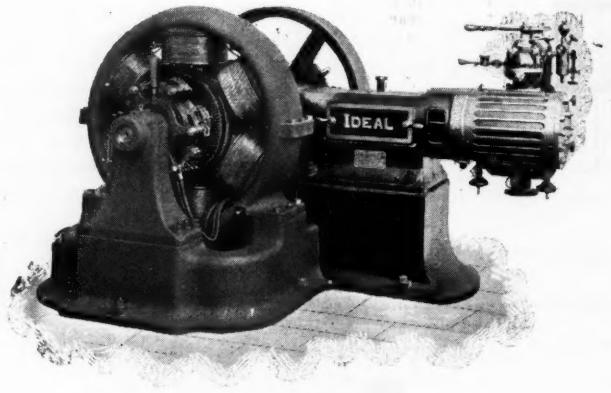
The Fisher Electric Manufacturing Company, Detroit, Mich., are the makers of these circuit-breakers.

A fire on May 1 in the Kent avenue power-house of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., destroyed a part of the building.

New Types of Direct-Connected Direct-Current Dynamos.

The constant advance in electrical design has brought the direct-current dynamo to a state of unique perfection as compared with other machines. Its efficiency is already so high that little more can be gained in that direction. The latest work has been, consequently, in the line of strengthening the mechanical construction of dynamos and in making these machines equal to any task that they may be called upon to perform. Success in this direction means a close attention to the minutiæ of structural details, a proper regard for the quality of materials used, and a careful design utilizing each part to the fullest advantage.

A modern type of direct current generator, direct-connected to a high-speed steam engine, is shown in the accompanying illustration. Of the usual multipolar type, it is distinguished by its large commutator, careful ventilation and well designed brush-holders. These machines are made in eight sizes by the Akron Electrical Manufacturing Company, of Akron, Ohio, and are intended for high-class isolated plant work.



DIRECT-CONNECTED, DIRECT-CURRENT DYNAMO.

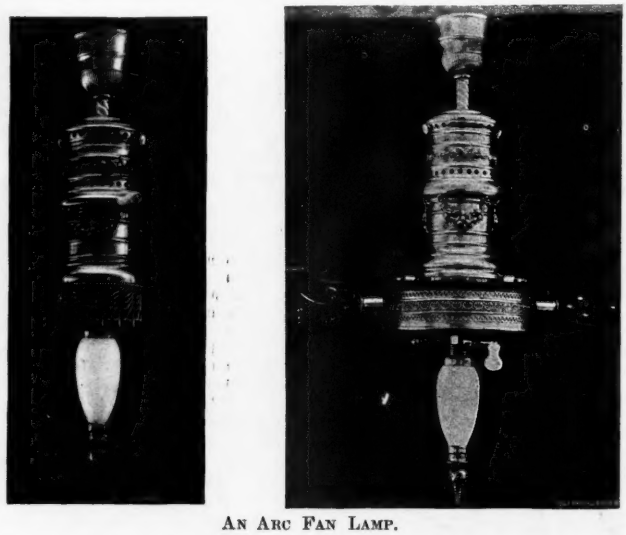
A Storage Battery Patent Decision.

In the motion for a preliminary injunction in the case of Electric Storage Battery Company vs. the Hatch Storage Battery Company, of Boston, argued on May 3 before Judge Colt, of the United States Circuit Court for the District of Massachusetts, a decision was handed down by the judge without leaving the bench. On request of the opposing counsel for a written opinion, the judge replied that the rights of the plaintiff in the action, with respect to the particular patent involved, had been so many times successfully litigated in actions embodying practically the same law and facts that a written opinion from him was unnecessary. The Brush patent covering the support of the active material in a storage battery plate was the patent on which the suit was brought.

An Arc Fan Lamp.

The combination of an enclosed arc lamp and a ceiling fan, shown in the accompanying illustration, is an ingenious and useful application of electricity to interior decoration and comfort. Its usefulness will be especially marked in restricted spaces where there is not room on the ceiling for both arcs and fans.

The motor armature, as the illustration shows, runs around the upper part of the lamp. It is mounted on ball bearings and carries either two or four blades, the speed being 200 revolutions per minute for the former and 170 revolutions per minute for the latter. The blades are 22½ inches long. In the Winter the armature and blades may be removed, leaving only the lamp. By the manipulation of a switch either the lamp or the fan alone may be worked, or both together. The lamp is of the long-burning enclosed type, requiring trimming only after 150 to 200 hours. The combination is made for 110, 220 and 500 volts, and on the 110-volt circuit is said to consume only five and one-half amperes with the fan running and the lamp lit. This interesting combination is made by the Interstate Electric Company, Cleveland, Ohio.



AN ARC FAN LAMP.

To Raise the Price of Leather Belting.

The Leather Belting Manufacturers' Association held a special meeting in New York city last week to consider a proposed raise in the price of belting. Thirty-four firms were represented. It was decided that prices be raised by lowering discounts from the association list, and that such advance be not less than 15 per cent over prices ruling on March 1, 1899.

An Artistic Catalogue.

One of the handsomest catalogues that has made its appearance this Spring is descriptive of Lundell fan motors, and is issued by the Sprague Electric Company, New York. In design, printing, illustration and general completeness the catalogue is a model that might well be consulted by any one about to prepare a similar descriptive pamphlet. The Sprague company is to be congratulated upon the beauty of the little book that tells about its fans.

A New Telephone Company.

The National Telephone Company, of Boston, Mass., which was formed by Hon. Geo. D. Sheibley, formerly of the Bell company, of Fostoria, Ohio, are now located in a large new factory at 1726 Glasgow avenue, St. Louis, Mo., under the management of Mr. W. J. Kurtz. The National company is arranging to install a model exchange at Belleville, Ill. The one-wire tower system will be used, with a new multiple 'phone and gravity drop switchboard. The new telephone company was incorporated at Belleville, Ill., with a capital stock of $20,000. One-half of the stock is already taken by prominent business men, and it is stated that contracts for 300 subscribers for five years have been secured. The system will have Kinloch connectio to St. Louis.

Electrical Exhibition Opening.

Madison Square Garden Brilliant With Electric Light.

THE THIRD ELECTRICAL AND KINDRED INDUSTRIES EXHIBITION FORMALLY THROWN OPEN TO THE PUBLIC ON MAY 8.

On Monday evening, May 8, in the presence of a vast crowd which filled the great building known as Madison Square Garden, in New York, the Electrical Exhibition was formally opened by a signal from Governor Roosevelt, who was in the Executive Mansion, Albany. Congratulatory telegrams were received from President McKinley and Governor Roosevelt, and read to the crowd by United States Senator Chauncey M. Depew, the speaker of the evening.

Following are the telegrams of President McKinley and Governor Roosevelt:

EXECUTIVE MANSION,
WASHINGTON, D. C., May 8, 1899.

I am glad to have an opportunity to participate in the exercises incident to the opening of the annual electrical exposition this evening and to congratulate those who are contributing to an increased knowledge in the field of electrical research and development. You have my best wishes for the success of the exposition. WILLIAM MCKINLEY.

EXECUTIVE MANSION,
ALBANY, N. Y., May 8, 1899.

I send my hearty well wishes. Nothing is more typical of our country and our age than such an exhibition as this, and, on the whole, no body of men has done more for her than those who have turned their extraordinary mechanical genius into the lines illustrated with you to-night. I congratulate ourselves as a people that we can claim you as our representatives. THEODORE ROOSEVELT.

Senator Depew was introduced by President A. M. Young, of the National Electric Light Association. Mr. Depew spoke of the advance since the days of Morse, and of the beneficent application of electricity for the comfort, safety and happiness of man. He said, in part:

The inventions of the past year are more important and more startling than all those which have preceded. Now we find that electricity is being turned to a hundred purposes in medicine, in the system of the human body, in the relief of human suffering and in the aid of human health. A Roentgen ray locates where the bullet is, and locates where the fracture can be found, but within the last year these medical electrical gentlemen put an electric bulb in the inside of your stomach and it reveals the processes of digestion. The result is that digestion, or rather indigestion, which has been a horror of the human race for all time, is yielding to the processes of electricity. Electricity is attacking rheumatism; electricity is assailing gout; electricity is curing paralysis, is sending light upon the blues. It is teaching us to prolong existence, and I predict that the time will soon come when every man and every woman can carry in their pockets an electrical machine by which the waste of matter can be overcome and the human being will be like an apple in a cold storage warehouse, preserved just as he is, for as many hundred years as he wants to live.

Now then, that is not all that electricity has done during the past year. It has become perfected to that extent that we can already see that from a wire in the street our houses are to be lighted by electricity—as they are; the elevators to be run by electricity—as they do now; also to do our cooking, our washing—in fact, everything that now takes labor and pain, and leads to bad language when it does not go right—will be made perfect by the discoveries of electricity.

The most striking feature of the show is the blaze of electric light. The illumination and decoration of the building are very effective.

The hall is oval in shape and across its roof are a large number of arched girders. These are draped with yellow and white bunting, which hangs in graceful folds completely concealing the ironwork and making a false ceiling considerably lower than the real one. The effect is exceedingly pleasing, as the proportions of the room are thus made more symmetrical and the effect of its vast size in some degree lessened. Upon the lower edges of the girders are placed 1,200 incandescent lamps and a great number of clusters of lamps are also suspended in mid-air from the ceiling. In addition to all this light there are hundreds of electric signs and innumerable lamps in the exhibits about the floor space.

While the exhibition was not entirely completed on the opening night, it was still in so far advanced a state that a good general idea of its final form might be had. On the main floor there are installed the exhibits of automobiles, of heavy machinery, engines, etc. The lighter exhibits are in the galleries. Here also are the exhibits of the United States Army and Navy, including an entire outfit of the Army Signal Corps for field telegraphing and telephoning. Many electrical relics of the late war with Spain are also to be seen, among them the searchlight of the United States battleship "Maine" and of the Spanish armored cruiser "Viscaya."

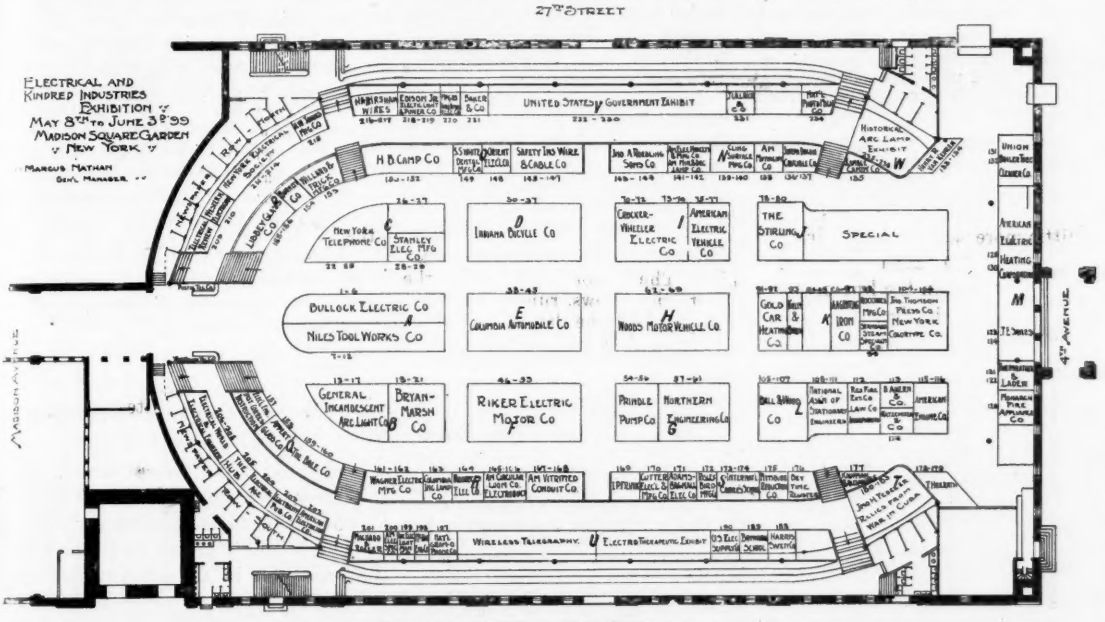
The greater part of the popular and amusing features of the show are not yet in working order, but will be within the next few days. These will include a radiophone, an apparatus whereby conversation is carried on over a beam of light, a mysterious electrical grotto in the cellar of the garden, electric fountains, etc. Among the most amusing feature of the opening night was an exhibit of a fire-escape, down which at regular intervals an amply built young woman climbed from the third story. Another consisted of a large tank, in which, in company with turtles, eels, frogs, etc., another young woman in a diving suit disported herself and conversed with the audience through a telephone.

There are about five automatic pianos which play themselves powerfully by electricity, one large organ pumped by electricity, and an enthusiastic brass band in the building, so that music of every kind is constantly on tap.

The attendance on the opening night was very large. The scene, as viewed from the galleries, was brilliant and impressive. The majority of the exhibits, or at least of those that were ready for inspection, were tastefully and handsomely finished, and several of them notable for the taste and ingenuity displayed in their arrangement.

The Exposition will remain open until June 3, and will, undoubtedly, repeat the success which has attended the former shows of the same character.

President A. M. Young, of the Electric Light Association, and President C. O. Baker, Jr., of the Electrical Exhibition Company, promptly telegraphed their thanks to the President and Governor, in behalf of the electrical fraternity, for their messages. A special message was also sent to Governor Roosevelt, thanking him for his kindness in starting the Exhibition by pressing a telegraph key in his library at Albany. General Superintendent Usher, of the Postal Telegraph-Cable Company, was in charge of the telegraphic work, and everything passed off in complete order. A telegraph operator received the messages at Mr. Depew's elbow, while he was speaking.



FLOOR PLAN OF THE ELECTRICAL EXHIBITION, MADISON SQUARE GARDEN, NEW YORK CITY.

EXHIBITION NOTES.

The show of historical arc lamps, under the supervision of Mr. E F. Peck, is interesting and instructive. The Crocker-Wheeler Electric Company exhibit a large number of dynamos and motors and the field-ring of a very large generator.

The accompanying plan of the exhibition shows the location of the exhibits, which will be more particularly described in later issues. The readers of the ELECTRICAL REVIEW are cordially invited to make themselves at home in its headquarters, at the head of the stairs to the left of the main entrance.

The main feature of the exhibition is the show of automobile vehicles. The Columbia Automobile Company, Hartford, Ct., exhibit nine vehicles and an ingenious "hydrant" or charging-post for electric vehicles. The Indiana Bicycle Company, Indianapolis, show six automobiles, and there are also the American, the Fischer and other exhibits of self-propelled carriages. A fine exhibit of motors direct-coupled to machine tools is shown by the Bullock Electrical Manufacturing Company. Among the most tasteful of the exhibits is that of the Safety Insulated Wire and Cable Company. John A. Roebling's Sons Company make a handsome exhibit. One of the most attractive displays is that of Libbey cut glass. The New York Telephone Company has a well decorated space, and is giving free telephone service to patrons of the exhibition. The General Incandescent Arc Light Company show a large number of lamps and fan motors. Baker & Company show a valuable exhibit of platinum in various forms.

General Electric Company's Report.

Owing to an error in the printing office of the ELECTRICAL REVIEW, the following matter contained in Vice-President Ord's report was omitted from the annual report of the General Electric Company, published last week:

FACTORY PLANTS.

	Book value Jan. 31, 1898.	Cost of additions during the year.	Written off at the end of the year.	Book value Jan. 31, 1899.
Real estate.....	$1,857,044 65	$387,353 66	$387,353 66	$1,857,044 65
Machinery.....	1,542,955 35	399,132 60	399,132 60	1,542,955 35
Patterns.....	1 00	70,483 81	70,483 81	1 00
Sundries*.....	1 00	40,769 51	40,769 51	1 00
Total.....	$3,400,002 00	$897,739 58	$897,739 58	$3,400,002 00
			Jan. 31, 1898.	Jan. 31, 1899.
Book value of Schenectady plant...			$2,300,000 90	$2,300,000 90
" " " Lynn "			900,000 80	900,000 80
" " " Harrison "			200,000 30	200,000 30
Totals as per balance sheet....			$3,400,002 00	$3,400,002 00

REAL ESTATE (OTHER THAN FACTORY PLANTS).

This account represents the investment in the Edison Building, 44 Broad street, New York city; also a four-story brick building covering five lots on the corner of Avenue B and Seventeenth street, New York city, and sundry parcels of land in various places, mostly improved and rented, which have been acquired at various times, chiefly in payment of debts.

All are free from mortgages and will be sold when opportunities offer.

This account has increased $28,506.11 during the year, chiefly by taking real estate in Chicago, Rockford and Rock Island in payment of debts.

STOCKS AND BONDS.

No material changes in the book valuations of stocks and bonds have been made since they were appraised two years ago.

The book value of those not readily salable was fixed on January 31, 1897, after careful examination of their worth at that time. Those having a market value are still carried under the price of then reported sales.

Schedules A and B annexed hereto contain lists of the most important of the company's holdings of stocks and bonds. Their total par value is $13,745,542.83. They are carried at an aggregate book value of..... $6,984,775 44

In addition, the company owns various other securities. As their present value is doubtful and their future value speculative, they are not set forth in the schedules. They are carried on the books as follows:

Stocks and bonds of local lighting and street railway companies wholly owned (par value $288,560)	116,053 45
Sundry holdings (par value $301,116).....	125,461 56
Miscellaneous securities of many underlying, manufacturing, selling and patent owning corporations and also of street railway and lighting companies, carried at $1 for each lot, in all.....	132 00
Total book value of all stocks and bonds, as per balance sheet.....	$7,226,422 45

I believe the actual present aggregate value of the foregoing described securities is fully equal to the total amount at which they stand on the books.

SALES OF STOCKS AND BONDS.

Pursuant to the established policy of selling securities which there is no special reason for holding permanently, various stocks and bonds have been sold for cash since the last annual report.

Their total par value was	$1,180,115 00
They were sold for	$1,070,960 39
They had been carried on the books at.....	746,498 36
Profit.....	$324,462 03

The money realized from the above sale of assets was not required for the current business of the company, but was expended upon extensions to the factory plants, in purchasing $300,000 of the company's own debentures, and to protect and improve existing investments by acquiring the following securities:

	Par Values. Bonds.	Stocks.
Schenectady Railway Company, New York.	$117,000	$188,100
Des Moines Water Power Company, Iowa.....	12,000	
Des Moines Edison Light Company.....	1,000	
Pueblo Electric Street Railway Company, Colorado.....	6,000	
Portland General Electric Company, Oregon.	25,000	
People's Electric Light and Power Company, Oswego, N. Y.....	2,000	73,500
West Street & North End Electric Railway Company, Washington....	43,000	
Winona Railway and Light Company, Minnesota.....	15,000	
Astoria Street Railway Company, Oregon ...	16,000	
Edison Electric Illuminating Company of New York.....		36,030
Edison Electric Illuminating Company of Brooklyn, N. Y.....		7,500
Edison Electric Company of New Orleans	46,000	3,100
Cleveland Electric Illuminating Company, Ohio		14,200
Compagnie Francaise, etc., Thomson-Houston, Paris.....		24,991
Compagnie Thomson-Houston de la Mediterranee, Paris		70,000
Union Elektricitats Gesellschaft, Berlin.....		23,800
Miscellaneous.....		90,000
Total par value	$288,000	$531,221

NOTES AND ACCOUNTS RECEIVABLE.

This account represents the total debts now due the company.

They appear in the balance sheet at an estimated realizable value, which I believe to be a fair one—i. e., their face, $5,806,961.75, less an allowance of $720,412.93 for possible losses.

FACE VALUES OF NOTES AND ACCOUNTS RECEIVABLE.

	Notes receivable.	Accounts receivable.	Total.
Total face value January 31, 1898.....	$1,909,465 27	$3,290,194 27	$5,199,659 54
Of which there have been settled during the past year.....	1,014,112 78	2,825,896 11	3,840,008 89
Leaving unmatured or unsettled—originating prior to the current year.....	$895,352 49	$464,298 16	$1,359,650 65
The unmatured and unsettled balances of the current year are.....	598,278 50	3,849,032 60	4,447,311 10
Total face value January 31, 1899..	$1,493,630 99	$4,313,330 76	$5,806,961 75

* Include office furniture and fixtures (of the factories), horses and trucks, shop fixtures, benches, steam fitting (above ground) for heating system, sprinkler system for fire protection, electric wiring of buildings, etc., etc.

The X-Ray in Diagnosis.

Some of the better class daily newspapers have lately taken to the discussion of scientific subjects, but it is not often that these are so intelligently handled as in the subjoined extract from the editorial columns of the New York *Mail and Express* of April 29:

For some days the world has been discussing the alleged discovery by a French medical scientist that consumption as a disease comes within the sphere of the bacteriologist, and that its cure, therefore, even when well advanced, becomes merely a matter of reaching and destroying germ life. Pending a final conclusion upon the merits of this proposition, we find another concerning the same disease which would appear to demand more serious attention on the part of the profession than it has yet publicly received.

In the current issue of the ELECTRICAL REVIEW Dr. William Rollins, in the course of a technical article on light, takes occasion to lament that, three years after Roentgen's discovery of the transparency of the human body to some of Lenard's rays, this most important method of diagnosis should not have come into general use. Not one physician in a hundred, he complains, employs it regularly, although with some diseases it enables us to make the earliest diagnosis. He adds:

To show how important this is, take consumption, which is responsible for one-seventh of the deaths from disease. If every one would be regularly examined, a matter taking only a short time, most of the cases could be saved, for Williams has proved that the signs can be detected so early that treatment is followed by prompt recovery, many cases not even requiring a change of climate. The fluoroscope, in Dr. Williams's hands, is constantly showing evidences of old tubercle scars in patients who never suspected they had been attacked by the disease. This is a point of great interest, for, if in so many cases nature has, unaided, effected a cure, we may expect, with a little help from medicine, that almost every case can be saved.

If the hope here held out can be realized, then will the X-ray diagnosis, in general use, become a greater blessing than the reported discovery of the French scientist, since, as it begins at the very beginning of the disease, it must save humanity from untold suffering while traveling toward the same end—cure. Surely, an application of electricity which would, through universal adoption, reduce the world's death list by one-seventh, might properly be stamped as the greatest of electrical triumphs.

The delay in its adoption is due, we believe, to causes plainly visible. There is, in the first place, an obstacle in that ultra-conservative element which still lingers in the medical profession. There is the obstacle of poverty, in which consumption finds so many of its victims. The present cost of the X-ray appliance, too, places it beyond the reach of physicians of very modest income. There is also the element of popular ignorance or neglect to be dealt with—postponing, as it does in so large a percentage of cases, expert examination until the disease is well intrenched.

Finally—and this is by no means to be underestimated—there is a widespread impression, both popular and professional, that while the X-ray is acting beneficially in one direction as a detective, it at the same time, save in most skillful hands, lays the foundation of other and unrelated troubles. Indeed, it is but 48 hours since an Illinois man was awarded $10,000 damages against a Chicago laboratory for the loss of a leg, alleged to be due to decomposition following improper application of the X-ray to his foot.

We can not doubt that the near future will witness the demolition of most of the objections mentioned; but those of voluntary neglect and dire poverty it will be difficult to overcome. They can, however, be minimized by educational effort and philanthropy—when the dawn of an inestimable blessing will break upon one of the most appalling ills that flesh is heir to.

The New Copper Combination.

The Amalgamated Copper Company has been formed under New Jersey laws, with $75,000,000 capital, and power to increase to any extent. This is said to be the preliminary incorporation in the great copper consolidation scheme mentioned in the ELECTRICAL REVIEW recently. It is said that there would be danger of disturbing the financial situation if the $400,000,000 combination should be formed at once, and therefore it is said to be the scheme to form several preliminary amalgamations which later on will be merged into one. It is said that the Amalgamated Copper Company will furnish the money to purchase the Anaconda, the Washoe, the Boston & Colorado, and the Parrott properties.

The annual election of the Rochester, N. Y., Gas and Electric Company resulted in the choice of the following to the offices named: President, J. Lee Judson; first vice-president, William Runkle; second vice-president, Frederick Cook; treasurer, George Archer; attorney, A. H. Harris; secretary and assistant treasurer, W. L. Cole; directors, J. L. Judson, William Runkle, Frederick Cook, Walter S. Johnston, George Archer, H. G. Runkle, Harry L. Brewster, A. H. Harris, George C. Hollister, Granger A. Hollister, John N. Beckley, George A. Redman and W. L. Cole.

The "Central" Direct-Current Fan Motor.

That the fan-motor season is to be a brisk one is clearly shown by the orders already received by the supply houses. The Central Electric Company, Chicago, report themselves very well satisfied with the placing of advance orders by central stations and dealers. That there should be no famine and that this company will continue to hold its reputation for the promptest shipments, the Central people have lately received a car-lot consignment and expect in this liberal manner to supply the Central direct-current fan motors to the trade.

All careful buyers wish to know the inside make-up of a fan motor, more so, perhaps, than to be told the color of the finish or that the guards are polished. Commencing at the bottom: the base is of circular form, with tripod feet, each foot being provided with rubber cushion to prevent marring any surface on which the motor may be placed. Inside of this base is placed the enameled rheostat, which operates by a lever, the handle for which is accessible without any danger from the revolving blades. This rheostat gives to the fans speeds of 1,100, 1,400 and 1,800 revolutions per minute for the 12-inch types, and 800, 1,200 and 1,500 revolutions per minute for 16-inch types of Central fan motors.

The wires in the desk types are led through the upright frame for connection with the motor fields. These fields are most carefully wound on spools and held in place by the pole-pieces, which render the fields easily inspected or removed.

The armature is of the latest improved type with laminated core, in the slotted periphery of which are placed the thoroughly insulated windings. They are so wound and protected that there is no danger of making contact on the pole-pieces. To remove the armature, take out plate that supports the commutator end of armature, said plate being held in position by three screws. The armature bearings are most carefully bored and positive alignment is assured.

The commutator segments are well insulated, one from the other, and circuit contact is made by flat carbon brushes under proper spring pressure. Lubrication is supplied by Albany compound, enough being furnished with each fan motor to last a season. A handle on top of motor body renders carrying the motor much easier than if the standard were depended on for that purpose. The regular external finish is in dark enamel, green color, striped with gold. Special colored enameling can be supplied, but prompt shipments are not promised in this case. The outline of the complete motor is exceedingly pleasing, and there is no

THE "CENTRAL" DIRECT-CURRENT FAN.

noise while running other than that of the blades in contact with the air. The first-class mechanical and electrical construction make the use of the Central fan motor highly satisfactory.

Each Central fan motor, excepting the ceiling type, comes packed in a separate box and all parts assembled ready for connection to circuit. This arrangement will better be appreciated during the rush season. The Central ceiling fan has the same high-class features as the desk and bracket types. It is highly efficient and attractive. The Central Electric Company, upon request, will gladly send pamphlets, folders, booklets or a catalogue on fan motors. The catalogue shows the direct, alternating and battery-current types.

A Belt-Transmission Test.

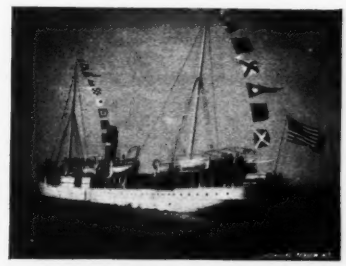
An interesting test of belt transmission was made a few days ago at the engineering laboratory of Cornell University. Upon a belt-testing machine, permitting measurements of power supplied, power delivered, tension on the belt, arcs of contact and slip, about 50 tests were made on belts before and after treatment with "cling-surface." The results show a marked increase in arc of contact, and greatly diminished slip, while the greatest transmission capacity for the belt treated with "cling-surface" was found when the belt was running as slack as possible. The material used in treating the belts is made by the Cling-Surface Manufacturing Company, Buffalo, N. Y.

The West Chicago Street Railway has declared a dividend of one and one-half per cent, payable May 15, to stock of record, May 5.

The Sailing of the United States Cableship "Hooker."

The first deep sea cable expedition ever sent out by the United States Government left New York on May 1, in charge of the United States Army Signal Corps. The cableship "Hooker," of which a brief description appeared in the ELECTRICAL REVIEW of April 26, having on board 200 miles of deep-sea and shore-end cable, is on its way to the Philippine Islands, where it is expected about June 20, and upon its arrival in those waters will lay numerous cables from island to island, and in loops along the shores.

The cable carried is insulated with rubber. The first coating that covers the wire is of pure gum, and around this is a seamless layer of rubber compound, which has already been tested at a depth of more than 6,000 feet of sea-water. Over the outside rubber coating are two layers of jute laid in reverse directions, and then an armoring of mild steel wires treated with hot asphalt. Over this is a layer of hemp, filled with a compound intended to resist the attacks of the teredo, a boring worm which has proved a dreaded enemy of submarine cables in tropical waters. It is stated that the vulcanized rubber



UNITED STATES CABLESHIP "HOOKER."

is repellant to this creature and other destructive forms of animal life.

When the ship sailed a number of invited guests were carried as far as Sandy Hook, among them being some representatives of the Safety Insulated Wire and Cable Company, who made all the cable. This company has the distinction of having made the first American deep sea cables. It has been recently announced by Mr. L. F. Requa, the general manager of the Safety company, that he intends to construct a water-front plant capable of building a trans-Pacific cable. It is to be hoped, when Congress provides for this vital and necessary link in our lines of communication, that the work of making the cable will fall to an American manufacturer.

Electric Motors for Operating Printing Presses.

For power where absolute and instant control is indispensable the electric motor has no equal. The great variety and flexibility of its many applications has caused its introduction in all industrial lines.

Of all machinery where instant control is necessary the requirements of the printing press are most exacting. The advantages to be gained and the great reliability of electric power at once became so apparent that a large number of the leading newspapers and printing establishments of the country have, within the last year or so, thrown aside expensive power equipments and substituted electric motors for operating their presses.

The Kansas City *Star* and the Union Bank Note Company have recently installed such equipments.

To each of the *Star's* five large double perfecting Hoe presses, having a combined capacity of 120,000 papers per hour, has been connected a 35-horse-power slow-speed multipolar motor. The motors are operated on 220-volt direct circuit from two 75-kilowatt dynamos driven by a Corliss engine.

In connection with each motor, a 20-horse-power Cutler-Hammer speed-regulating rheostat is used. These rheostats are provided with a sensitive overload device and an automatic release. The rheostats stand on the top of the presses, and from each a circuit, in which a number of switches are placed, extends to all parts of the press. By opening any one of these switches the automatic release is thrown, and the press is brought to an instant stop. By means of the rheostats the press can be started at the lowest possible speeds and operated at all intermediate speeds to the maximum. This not only facilitates the changing of plates and rollers, but makes a great saving in paper wasted in breakage.

The Union Bank Note Company has a complete electric plant, consisting of an Ideal engine and direct-connected Lundell generator, with motors ranging from one-quarter to three horse-power, all direct connected to presses on different floors. Upon the extended driving-shaft of each press a separate motor is mounted. Controllers and rheostats give variations of speed from 75 to 1,800 revolutions per minute on the different presses.

These installations are the only two of the kind between Chicago and San Francisco, and in them are embodied the latest improvements in these lines.

Telephone News .....and Comment

A telephone line, for the exclusive use of the government, will be constructed to connect Havana with all its suburbs.

The new telephone line from Pearisburg via Narrows to Peterstown, W. Va., thence to Lowell, W. Va , is nearing completion. When this line is completed it will be connected by exchange at Pearisburg with the Pulaski, Wytheville and Bristol lines.

The Central New York Telephone and Telegraph Company has issued its official list of subscribers of No. 14, covering the cities of Syracuse and Utica, N. Y., as well as numerous smaller exchanges in that vicinity. The list is conveniently arranged and well prepared.

The Northern Telephone Company, of Pocahontas County, Va., has been incorporated with $10,000 capital. It is to be another of the numerous mutual companies in the state organized to perfect the chain of anti-Bell lines. George Sanborn, A. L. Roberts and A. S. Moore are the incorporators.

An effort is being made in Longmont, Colo., to organize a local telephone company by resident parties. Its promoters expect to secure contracts to put in 100 instruments at a rental of $1 per month. If the required number of subscribers are secured the line will be built immediately.

The Hipwell Manufacturing Company, of Allegheny, Pa., is sending out a circular letter to other manufacturers in opposition to the proposed consolidation of the independent telephone manufacturers. This company urges its claim on the ground that the purpose of the so-called trust is to raise the price of telephone apparatus.

At the annual meeting of the stockholders of the Northern New York Telephone Company, held at No. 15 Dey street, New York, N. Y., May 1, 1899, the following were elected directors for the ensuing year: Benjamin F. Sargent, Henry L. Tibbetts, Charles T. Crosby, Thomas Sherwin, John H. Cahill, David B. Parker and George A. Roper.

At the annual meeting of the stockholders of the New England Telephone and Telegraph Company, held at No. 15 Dey street, New York, N. Y., May 1, 1899, the following were elected directors for the ensuing year: Charles F. Ayer, John H. Cahill, Benjamin C. Dean, William H. Elliot, John E. Hudson, Henry S. Hyde, David B. Parker, Moses G. Parker, Stephen Salisbury and Thomas Sherwin.

At the annual meeting of the stockholders of the New York Telephone Company, held at No. 15 Dey street, New York, N. Y., May 2, 1899, the following were elected directors for the ensuing year: Charles F. Cutler, Thomas F. Clark, John H. Cahill, Joseph P. Davis, Thomas T. Eckert, George J. Gould, Edward J. Hall, John E. Hudson, Winfield S. Hutchinson, James Merrihew, Thomas Sherwin, Charles A. Tinker and William H. Woolverton.

Wireless Telegraphy Unequal to the Occasion.

They are a serious-minded, middle-aged couple with a taste for isms and ologies and other occult subjects that are beyond the grasp of the common herd. At different times they dabbled in both mental and Christian science, esoteric Buddhism, theosophy, spiritualism, Delsarteism, the Kneipp cure, table-rapping, Browning clubs, and many other things that were delightfully unintelligible. Their latest aberration was on the subject of telepathy, and they were getting along famously at thought-transferrence, when the husband failed to do his duty in a most human and vulgar way. The wife had gone to Florida for a short vacation from the grip and pneumonia, and before leaving arranged with her husband to test telepathic communication from a long distance. It was arranged that at four o'clock every afternoon he was to dismiss everything from his mind and sit quietly in a receptive mood while his wife tried by intense concentration to project a message to him. At half-past four the mental attitudes were to be reversed, and the husband was to forward his reply by thought waves.

For the first few days nothing happened, and both their minds remained blank, while the messages were either lost or stolen by some Mahatma. But one afternoon it was strongly impressed on the mind of the husband that his wife was sending him this familiar message:

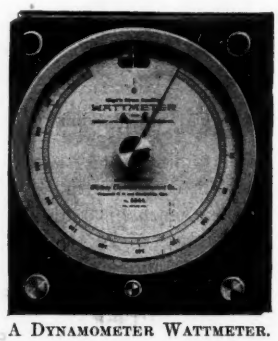
"I want some money."

When the husband tried to concentrate his mind to project the reply he found himself unable to control his psychic force, so he rang for a messenger and wired to his wife, "Have none to spare."—*Harper's Bazar.*

A Dynamometer Wattmeter.

The illustration shows a new type of direct-reading wattmeter, which possesses several points of novelty. It contains an arrangement for its own calibration, whereby it may be checked against itself without the employment of the usual standards. At all loads the angle between the fixed and moving coils remains constant, which insures the accuracy of the instrument despite variations in power-factor, wave-form, or frequency of the circuit.

The instrument is made by the Whitney Electrical Instrument Company, of Penacook, N. H. Messrs.



A DYNAMOMETER WATTMETER.

Machado & Roller, New York, have just concluded arrangements with this company for handling all its products in the market.

LITERARY.

Mr. J. J. Fahie, M. I. E. E., has now in press "A History of Wireless Telegraphy from 1838 to 1899." This book, we are informed, deals with the subject in a very complete manner, from its first inception in 1838 up to the present day, with numerous illustrations and portraits of workers in the field of wireless telegraphy. The work should be a timely one.

Paul Leicester Ford, the historian and novelist, has gathered together from various sources a number of new stories of Washington, and publishes them in the May *Ladies' Home Journal* as "The Anecdotal Side of George Washington." All the stories are capitally told, and together they reveal the characteristics of the great American in a most interesting and impressive manner.

Robert Barr, in the first of a series of papers on his travels and troubles in the Orient, tells some stirring stories of American "guns that can speak Turkish." "Life would not be so very well worth living along these shores if it were not for the American cruisers, which do many things that fail to appear in the official dispatches." Just how United States naval officers sometimes deal with troublesome Turks, Mr. Barr tells in the *Saturday Evening Post* of May 13.

The illustrations which accompany Senator Lodge's history of the Spanish-American War would in themselves make *Harper's Magazine* for May worthy of note. In this installment Senator Lodge discusses with keen historical insight and criticism the land campaign around Santiago The article contains 27 illustrations by eminent artists and from photographs. There are half a dozen full-page drawings by R. F. Zogbaum, Howard Chandler Christy, Carlton T. Chapman and T. de Thulstrup, which deserve special mention. The drawings include vivid portrayals of a Hotchkiss battery in action at Las Guasimas, the capture of El Caney, the landing at Daiquiri, the capture of the block-house at San Juan and Gen. H. S. Hawkins at San Juan.

We are indebted to *Leslie's Weekly*, the well known illustrated journal of New York, for the finest publication relating to the Spanish-American War that has yet made its appearance. It comprises a large and beautifully bound volume, magnificently illustrated, of over 600 pages. A full-page portrait of President McKinley is the frontispiece. The book is called "Leslie's Official History of the Spanish-American War," and it comprises a pictorial and descriptive record of the Cuban rebellion and a complete account of our conflict with Spain on land and sea. In addition it carries full information respecting Cuba, Porto Rico, the Philippines and Hawaii. The great staff of war artists that the enterprising management of *Leslie's Weekly* had working for it during the war, have contributed to the success of the publication in no small degree. The history is indorsed by the President, the Secretary of War, General Shafter, General Wheeler, Adjutant-General Corbin, and other distinguished officials, and is a particularly complete and interesting publication. The history, we note, is to be sold exclusively by subscription, and will undoubtedly find a place in every library of consequence in the United States.

Detroit, Pingree and Street Railways.

A city that has been able to maintain and operate Mr. Pingree ought not to have any trouble with such a tame institution as a street-railway system.—*The Journal, Detroit.*

The Berlin Iron Bridge Company Gives an Oyster Roast.

In accordance with an established custom, the Berlin Iron Bridge Company, of East Berlin, Ct., entertained its employés and their families, as well as a large number of invited guests, at its sixth annual oyster roast on April 26. About 2,500 persons were present, every city and large town in the state of Connecticut being represented. Numerous state senators and city officials were among the invited guests. One of the immense shop buildings was decorated with electric lights and filled with long tables, which were filled with roasted oysters and boxes of crackers. At these the guests stood and ate their fill. In another building the floor was arranged for dancing, and music was dispensed by the Berlin Iron Bridge Company's band.

The oysters were brought in barrels on freight cars, which were lined up along one side of the building. As fast as the barrels were opened, large iron shovels were filled with them, and the oysters were roasted over the furnaces used in the foundry. In another building sandwiches and liquid refreshments were served to the thirsty crowd.

Amidst the tempting crackling of the oyster shells, President C. M. Jarvis, of the company, informed the representative of the ELECTRICAL REVIEW that this was the most successful oyster roast in the history of the company.

New York Gas and Electric Light, Heat and Power Company.

The New York Gas and Electric Light, Heat and Power Company, incorporated in New York state with a capital of $36,000,000, has effected an organization for temporary service. The directorate has been reconstructed. Anthony N. Brady succeeds H. W. Alcott, Thomas E. Murry J. N. Wallace, Daniel F. Shea, C. M. Flint, Thomas J. Reagan and J. F. Yawger. The board of officers, as reconstituted, is: President, Anthony N. Brady; secretary, Frank D. Allen; treasurer, Henry J. Hemmens; general manager, Thomas E. Murry; assistant general manager, John W. Lieb. The offices of the company have hitherto been those of Beardsley & Hemmens, at 54 Wall street, but the company is in a few days to establish itself in the Edison Building, in Duane street.

Since incorporation the company has acquired the following properties: Practically the entire capital stock, or 92,000 shares, of the Edison Electric Illuminating Company of New York; 15,000 shares of the capital stock of the Mount Morris Electric Light Company; 4,000 shares, or all, of the stock of the North River Electric Light and Power Company, and $400,000 of the bonds of this company; 3,750 shares of the stock and $320,000 of the bonds of the New York Heat, Light and Power Company; 1,000 shares of the stock of the Borough of Manhattan Electric Company; 15,000 shares of the stock and $4,225,000 of bonds, out of a total issue of 18,750 shares of stock and $6,725,000 of the bonds of the Consolidated Telegraph and Electrical Subway Company; 900 shares, or the total capital stock, of the Block Lighting and Power Company, No. 1; 2,500 shares of the stock and $250,000 of the bonds of the Manhattan Lighting Company, being the entire issue of the stock and bonds of the company; the entire capital stock and all the bonds of the Yonkers Electric Light and Power Company, as well as half the subways of the Empire City Subway Company.

The New York Gas and Electric Light, Heat and Power Company has given to the Central Trust Company a mortgage for $21,000,000, covering its property at Ninety-seventh street and First avenue and its franchises and privileges. The mortgage runs for 50 years, and the revenue stamps on it amounted to $10,499.50.

New 10-Story Building for the Western Electric Company, Chicago.

The accompanying illustration represents the new 10-story building just being completed for the Western Electric Company, of Chicago, on the corner of Clinton and Congress streets. It is one of a group of 15 similar buildings which compose the works of the above-named company.

As will be seen, the building is 10 stories in height, including a basement. A portion of the main story of this building will be a continuation of the power-house and engine-room which adjoins it on the west; and when fully equipped will contain engines aggregating 4,000 horsepower.

THE WESTERN ELECTRIC COMPANY'S NEW BUILDING IN CHICAGO.

Electric power will be transmitted to the other buildings occupied by the company from the power-house, being conveyed through iron conduits. Part of this main floor will also be used as a shipping department and also as an extension to the foundry. The next five stories will be utilized by one of the largest departments of the plant for insulating copper wires, and here will be found machinery which will cover with the different materials used for insulating wires for all classes of service, telephone, telegraph and power. This department will employ a large number of workmen, and will have every modern appliance necessary for the insulation of wires and cables.

The eighth floor will be a continuation of the general offices which already extend 220 feet west on Congress and 180 feet south on Jefferson streets.

The ninth floor will amply accommodate the drafting department and will be used by them.

The tenth floor will contain the chemical laboratory departments for photographing, blue-printing and calibrating.

The principal entrances, corner of Clinton and Congress streets, finished in bronze and cast-iron, with a spacious vestibule of Numidian marble, dome ceiling and mosaic floor, will lead to the entire executive departments of all the buildings. This building, as well as the others composing this group, is built of steel and tile and is strictly fireproof in everything used in its construction, even the glass in the windows being solid-wire glass in copper metal frames The interior of the offices and reception-room is beautifully finished in mahogany. The cost of this building alone is $200,000, and it was designed by Mr. S. A. Treat, the company's architect. The whole plant of the Western Electric Company in Chicago comprises a floor space of 27 acres.

American Institute of Electrical Engineers.

The 134th meeting of the Institute, held at 12 West Thirty-first street, New York, April 26, was devoted to a topical discussion on "The Limitation of Power Subdivision by Electric Motors in Manufacturing Establishments." Mr. Gano S. Dunn, of the Crocker-Wheeler Electric Company, opened the discussion which was participated in by Messrs. R. T. Lozier, H. B. Coho, H. Ward Leonard, Arthur Williams, Jesse M. Smith, Oberlin Smith, Douglass Burnett, Geo. Hill and F. M. Pedersen. At the meeting of the executive committee in the afternoon the following associate members were elected: Joseph Clement, R. Laurie Ellis, John Ellis, Albert F. Ganz, A. P. Kennedy, W. H. Lawrence, Oliver S. Lyford, Jr., Raymond S. Masson, M. Namba, John S. Peck, Walter Wilson Reed, Edward F. Schurig, Charles Edward Skinner, Gerard Swope, Walter Farrington Wells, Robert A. Widdicombe, Walter Douglas Young.

The following were transferred to membership: H. Eugene Chubbuck, manager Quincy lighting companies, Quincy, Ill.; William Slocum Barstow, general manager Edison Electric Illuminating Company, Brooklyn, N. Y.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

STOCKPORT, OHIO—The Morgan County Telephone Company has been incorporated; capital, $10,000; incorporators, C. H. Foutz, T. J. Lyne, W. H. Broomhall, T. J. Mercer, E. S. Pierrot, all of Stockport.

AKRON, OHIO—The People's Telephone Company has been incorporated; capital, $150,000; incorporators, Will Christy, J. R. Nutt, E. H. Gibbs, John P. Loomis, R. S. Iredell, all of Akron.

CIRCLEVILLE, OHIO—The Circleville Telephone Company has been incorporated; capital, $10,000; incorporators, Charles E. Groce, Wm. T. Bell, B. F. Benford, John L. Kimmel, F. M. Shulze, all of Circleville.

KIRKSVILLE, MO.—The Kirksville Telephone Company has been incorporated; capital, $14,000; incorporators, J. M. Kennedy, J. C. Storm, S. M. Link, H. C. McCahan, V. Miller, Charles E. Still, all of Kirksville, Mo.

FULTON CHAIN, N. Y.—The Webb Telephone and Telegraph Company has been incorporated. Its general route is to be from Utica to Malone, and from Fulton Chain to Fourth Lake, Raquette Lake, Blue Mountain Lake, Long Lake and Saratoga; from Beaver, N. Y., to Lowville, to Utica; from Big Moose Station to Big Moose Lake, and from Herkimer to Remsen, and from Fulton Chain to Boonville; from Herkimer to Utica and elsewhere in the counties of Oneida, Herkimer, Lewis and Hamilton. The capital stock is $10,000. The directors are Dennis Maynehan, of Clearwater; Frank E. Stephens, of Utica; Daniel F. Stroebel, of Cold Brook; Bartlett Manion, of Herkimer; Monroe H. Bullock, of Old Forge, and Charles H. Van Auken, of Fulton Chain.

FRANKFORT, KY.—The Frankfort Telephone Company, which is being promoted by W. W. Longmoor, of this city, and Cynthiana parties, has been incorporated; capital stock, $10,000. The company is to do exclusively local service.

CHETOPA, KAS—The Indian Telephone Company has been incorporated. It is chartered to build a telephone line from Chetopa to Wagoner, I. T., and also from Vinita to Mioni, I. T. The capital stock is $10,000. Ex-Congressman Dick Blue is interested.

GUTHRIE, O. T.—Articles of incorporation of the Oklahoma & Kansas Telephone Company have been filed in the office of Secretary Jenkins. It proposes to construct, operate and maintain telephone and toll lines and telephone exchanges in towns in Oklahoma and throughout all counties. The principal business office is to be located at Medford. The directors are John W. Pyle and Frank L. Pyle, of Medford, and W. B. Ingram, of Mount Ayr, Iowa; the capital stock is $30,000, and is divided into 1,000 shares of $30 each.

MCMINNVILLE, TENN.—The McMinnville Telephone Company has bought out the Smithville Telephone Company and the line from Smithville to Dibrell, via Sulphur Springs, and will at once extend the line to McMinnville and connect it with the McMinnville exchange.

LAPORTE, IND.—The Laporte Telephone Company has decided to build a telephone line between Laporte, Kingsbury, Union Mills and Hanna, the work to be begun almost immediately. The company will build the line under authority granted in the old A. J. Stahl franchise, which is still in force.

BRIMFIELD, ILL.—The Brimfield Telephone Company has been incorporated, with a capital stock of $500; incorporators, Addison Pacey, J. H. Casson and C. L. Dungan.

BOSTON, MASS—The Home Telephone and Telegraph Company has been incorporated. Incorporators: E. W. Barton, president; C. G. Adams, treasurer. Capital, $100,000.

JOHNSTOWN, PA.—E. B. Cresswell, of this place, has been awarded the contract for building a trunk line between Summerhill and Gallitzin for the C., D. & P. Telephone Company, a distance of about 20 miles.

WARREN, OHIO—The deal was closed to-day whereby the United States Telephone Company, of Cleveland, will connect with Warren and Niles, independent lines. The company agrees to have the line to Youngstown and Cleveland operating in 60 days.

CHICAGO, ILL.—The American Telephone Company has been incorporated; capital, $2,500; incorporators, George H. Taylor, Albert Martin, George C. Wilder.

ALBANY, N. Y.—The Seaboard Telegraph and Telephone Company has been incorporated, with a capital of $100,000, to construct a telephone line from Far Rockaway, on Long Island, to Montauk Point and intermediate points, thence to Orient and also westerly throughout the island to and including Long Island City and Brooklyn. The directors are J. Carl Schmuck, of Lawrence; Andrew McTigue, L. T. Walter, Jr., and B. C. Lockwood, of Far Rockaway; John Adikes, of Jamaica; George Christians and Samuel R. Smith, of Freeport.

ALBANY, N. Y.—The Webb Telephone and Telegraph Company has been incorporated to operate from Utica to Malone, Fulton Chain, Fourth Lake, Racquette Lake, Blue Mountain Lake, Long Lake, Beaver, Lowville, Big Moose Station, Big Moose Lake, Remsen, Boonville, Herkimer and other places in Herkimer, Oneida, Lewis and Hamilton counties; capital, $10,000; directors, Dennis Monahan, of Clearwater; Frank E. Stephens, of Utica; Daniel F. Stroebel, of Cold Brook; Bartlett Manion, of Herkimer; M. H. Bullock, of Beaver; F. E. Schenck, of Old Forge, and C. H. Van Aken, of Fulton Chain.

New Incorporations.

WILMINGTON, DEL.—A charter has been granted to the Underground Conduit Company, with a capital stock of $150,000.

BUFFALO, N. Y.—The National Motor Company has been incorporated; capital, $50,000; directors, John Laughlin, Michael H. Purcell, James Delahanty and Henry J. Skinner, of Buffalo, and H. R. Hoffeld, of Lancaster, Pa.

YORK, PA.—A new electrical company has been organized in this city to be known as the Tucker Manufacturing Company, with a capital stock of $5,000; incorporators, Chas. E. Tucker, president and manager; Eli Deardorf, treasurer and secretary; board of directors, H. B. King, Harry L. Seifert, W. T. Hess, W. G. Hess and L. S. Jenkins.

CAMDEN, N. J.—The National Electric Company has been incorporated; capital, $25,000,000; incorporators, Frank R. Hansell, William F. Eidell and George H. B. Martin.

CHICAGO, ILL.—The Rolfe Electric Company has been incorporated; capital stock, $50,000; incorporators, Henry H. Belfield, Charles A. Rolfe and A. Miller Belfield.

SEATTLE, WASH.—The Seattle Cataract Company, with a capital stock of $100,000, has been incorporated by Charles H. Baker, H. R. Clise and Thomas R. Shepard, for the purpose of engaging in the electric light and power business. The company will be sole licensee in Seattle of the Snoqualmie Power Company, transmitting the power electrically from Snoqualmie Falls. The stock of the Cataract company has been largely subscribed by local citizens.

CHICAGO, ILL.—The Independence Telephone Company, of this city, has certified to a change of name to the Autoblast and Power Company, and has reduced its capital stock from $1,000,000 to $100,000. Hereafter the company will devote itself to manufacturing electrical devices and appliances.

OWENSBORO, KY.—The Kentucky Electrical Company has been incorporated here with paid-up stock of $22,500, for the manufacture of electrical supplies of all kinds.

New Electric Railways.

TERRE HAUTE, IND.—Boston capitalists have petitioned to commissioners of Vigo County for permission to construct an electric suburban railway between this city and Brazil, Ind. The distance is a little over 16 miles. It is expected that work will commence within a few weeks.

BETHLEHEM, PA.—The Allentown & Bethlehem Rapid Transit Company and Allentown & Lehigh Valley Traction Company have succeeded in securing an extension of their seven-year privilege to run over the New street Bridge B, for 13 years more, from May 1, 1899.

MAUCH CHUNK, PA.—An electric road will be built from this place to Summit Hill, connecting the former place direct with Tamaqua by trolley.

LANCASTER, PA.—Arrangements are in progress for the reorganization of the Pennsylvania Traction Company, now in the hands of Receiver William B. Given. The new company will be called the Conestoga Traction Company. The directors of the Conestoga will be Samuel R. Shipley, president of the Provident company; B. J. McGrann, W. B. Given, John D. Skiles and J. W. B. Bausman. The new company will extend the trolley system to New Holland and other points in the country.

COLORADO SPRINGS, COLO.—A syndicate of Colorado Springs capitalists, headed by W. S. Stratton, who recently sold the Independence mine to English capitalists for $10,000,000, has purchased the Cripple Creek District Electric Railroad, and will extend it immediately to Colorado Springs. It has 25 miles of track, reaching the principal mines.

Electric Light and Power.

DENVER, COLO.—The Denver Gas and Electric Company has been incorporated, with a capital stock of $3,500,000. The incorporators are Elroy N. Clark, Herman H. Dunham and Charles W. Waterman. Its affairs are to be conducted by a board of 13 directors, as follows: William S. Van Saun, Tobias B. Liverman, Sim W. Cantrell, Frank H. Du Puy, Guy Young, Hobert C. Young, Angus W. Ward, William A. Burke, Elroy N. Clark, Herman H. Dunham, William W. Field, Charles W. Waterson and George Treadway Thompson, all of Denver.

WILMINGTON, DEL.—A charter has been granted to the Universal Conduit Light, Heat and Power Company, with a capital stock of $150,000.

SPARTA, MICH—A franchise has been granted to Jacob L. Hisey, of the firm of Jackson & Hisey, to erect and conduct an electric lighting plant for a period of 10 years. The town is to be lighted by 10 1,200-candle-power arc lamps and two 32-candle-power incandescent lamps. The plant is to be completed and in running order on or before July 1.

TRENTON, N. J.—The Essex Union Water and Light Company, to furnish light and water to municipalities, has been incorporated. The capital stock is $500,000.

HARRISON, N. J.—The Harrison Light and Power Company has been incorporated. The capital stock is $50,000. The incorporators are Henry J. West and Harry Reeves, of Gloucester city, and Paul T. Sherin, of Camden.